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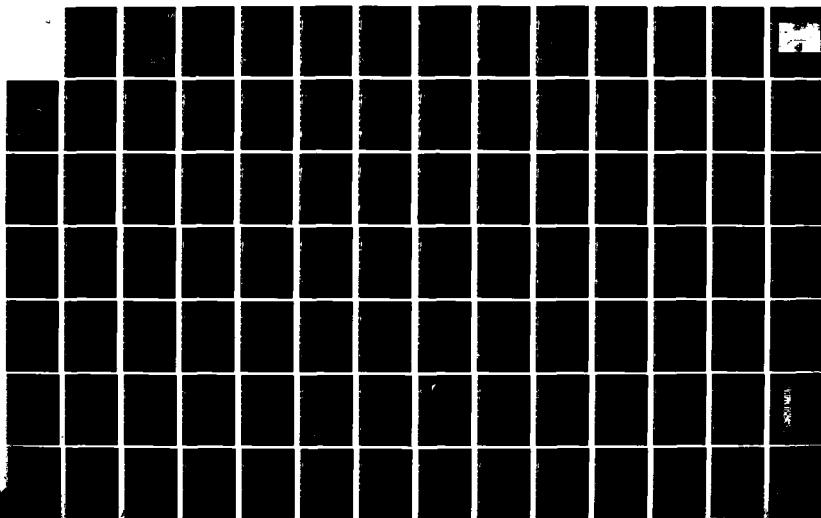
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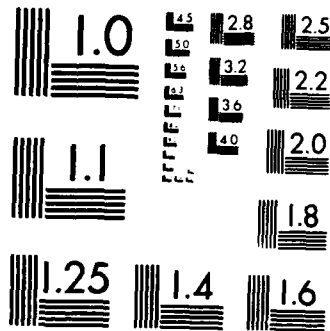
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**THAMES RIVER BASIN
NORWICH, CONNECTICUT**



AD-A143 498

**FAIRVIEW RESERVOIR DAM
CT 00205**

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.**

NOVEMBER 1978

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Fairview Reservoir Dam is an earth dam with a masonry core wall constructed around 1868 and is used today as a standby water supply for the city of Norwich. The dam has a maximum height of 28.0 ft. and is approx. 520.0 ft. long, with a top width of 27.0 ft. The dam is considered to be in FAIR condition Based on the size and hazard classification of the Corps of Engineers guidelines, the test flood for this dam is the PMF.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

DEC 11 1978

Dear Governor Grasso:

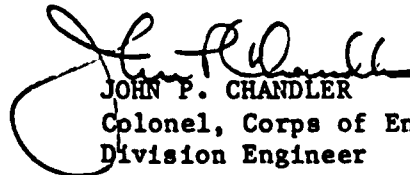
I am forwarding to you a copy of the Fairview Reservoir Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Town of Norwich, Public Utilities Department, Norwich, Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

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FAIRVIEW RESERVOIR DAM

CT 00205

THAMES RIVER BASIN
NORWICH, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

IDENTIFICATION NO: CT 00205

NAME OF DAM: FAIRVIEW RESERVOIR DAM

TOWN: NORWICH

COUNTY AND STATE: NEW LONDON COUNTY, CONNECTICUT

STREAM: BOBBIN MILL BROOK

DATE OF INSPECTION: 19 JUNE, 1978

BRIEF ASSESSMENT

Fairview Reservoir Dam is an earth dam with a masonry core wall constructed around 1868 and is used today as a standby water supply for the city of Norwich. The dam has a maximum height of 28.0 feet and is approximately 520.0 feet long, with a top width of 27.0 feet. There are four auxilliary dikes -the Northeast Dike, the Northwest Dike, the Connection Dike, and Middle Dike. The dikes are located at the north end of the reservoir as shown in Appendix B. All four dikes are earth embankments of the same construction and similar to the main dam. The outlet spillway is located in the Northwest Dike and is 27.0 feet long. The outlet works at the dam consist of an intake structure and valve chamber. The outlet conduits lead to a pumping station and then to the chlorination plant, which are

connected to the city water system. The intake structure and valve chamber controls no longer function and flow is regulated at the pump station.

Due to its age, Fairview Reservoir Dam was neither designed nor constructed by present state-of-the-art methods. Based upon the visual inspection, the lack of engineering design data available, and limited operational or maintenance evidence, there are areas of concern which must be corrected to assure the long-term performance of this dam. The dam is considered to be in FAIR condition.

Several visible signs of distress which indicate potential hazards are: seepage at two spots at the downstream toe of the dam, seepage through the roof of the valve chamber, rotting stumps on the main embankment, trees and shrubs on the downstream face of the main dam and both faces of all the dikes, structural deterioration of and seepage from under the spillway, rusted outlet conduits at the valve chamber with valves frozen in the open position allowing constant pressurized outlet pipes to pass through the embankment, and a general lack of regular maintenance.

Based on the size and hazard classification of the Corps of Engineers guidelines, the test flood for this dam is the Probable Maximum Flood (PMF). A PMF outflow

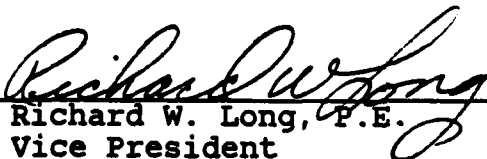
of 1356 cfs (2086 csm) would overtop the dam by about 0.7 foot; therefore, the spillway is considered to be inadequate in size. The maximum spillway discharge is 648 cfs, or about 48 percent of the test flood outflow. Overtopping could result in the failure of the dam.

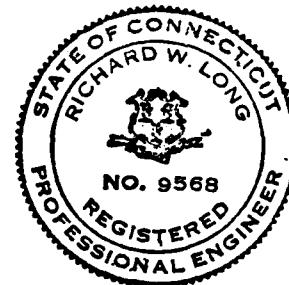
Specific recommendations and remedial measures that should be implemented by the Owner within 1 year after receipt of this Phase I Inspection Report are described in Section 7.

The alternative to these recommendations would be to partially drain the reservoir and maintain the water surface at a reduced level.

C-E MAGUIRE, INC.

BY:


Richard W. Long, P.E.
Vice President



This Phase I Inspection Report on Fairview Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

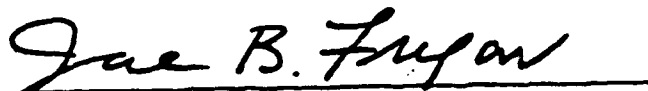


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property.. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

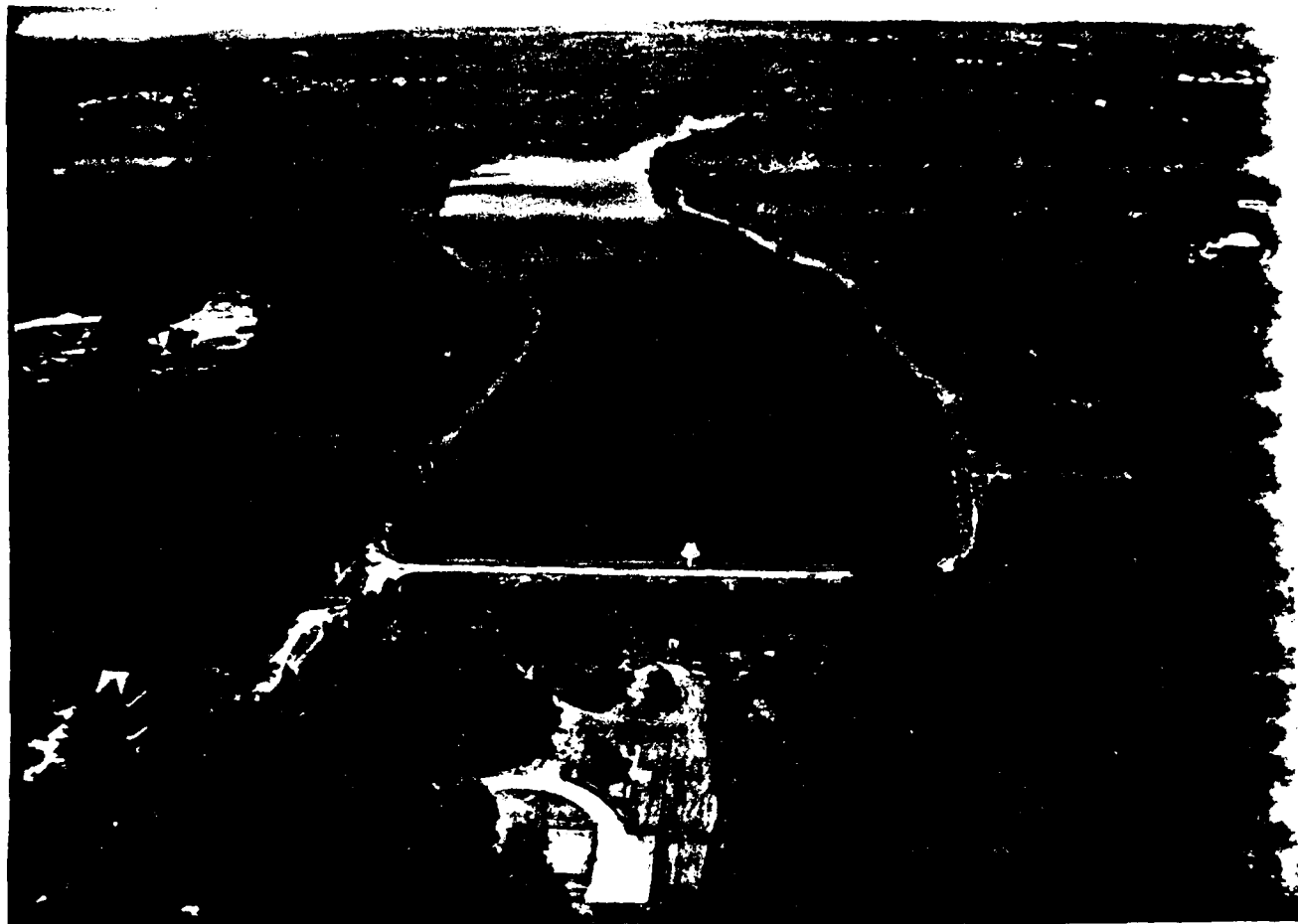
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

TABLE OF CONTENTS

	<u>Page</u>
TRANSMITTAL LETTER	
BRIEF ASSESSMENT	
REVIEW BOARD PAGE	
PREFACE	i
TABLE OF CONTENTS	ii
OVERVIEW PHOTO	iv
LOCATION MAP	v
REPORT	
SECTION 1 - PROJECT INFORMATION	
1.1 General	1
1.2 Description of Project	2
1.3 Pertinent Data	8
SECTION 2 - ENGINEERING DATA	
2.1 Design	14
2.2 Construction	14
2.3 Operation	14
2.4 Evaluation	14
SECTION 3 - VISUAL INSPECTION	
3.1 Findings	16
3.2 Evaluation	21
SECTION 4 - OPERATIONAL PROCEDURES	
4.1 Procedures	23
4.2 Maintenance of Dam	23
4.3 Maintenance of Operating Facilities	24
4.4 Description of Any Warning System in Effect	24
4.5 Evaluation	25

TABLE OF CONTENTS (Cont.)

	<u>Page</u>
SECTION 5 - HYDRAULIC/HYDROLOGIC	
5.1 Evaluation of Features	26
SECTION 6 - STRUCTURAL STABILITY	
6.1 Evaluation of Structural Stability	31
SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES	
7.1 Dam Assessment	33
7.2 Recommendations	36
7.3 Remedial Measures	37
7.4 Alternatives	39
APPENDIX A	CHECK LIST-VISUAL INSPECTION
APPENDIX B	AVAILABLE DATA
APPENDIX C	SELECTED PHOTOS
APPENDIX D	HYDROLOGIC/HYDRAULIC
APPENDIX E	INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS



C-1 FAIRVIEW RESERVOIR - LOOKING NORTH



NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: FAIRVIEW RESERVOIR DAM

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

- a. Authority: Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England region. C-E Maguire, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to C-E Maguire, Inc. under a letter of 26 April, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0300 has been assigned by the Corps of Engineers for this work.

b. Purpose

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
2. Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

- a. Location: Fairview Reservoir Dam is located in New London County, Connecticut, approximately 1.0 miles northeast of the village of Norwichtown (See Plate No. 1). The dam impounds water from Bobbin Mill Brook which drains a 0.65 square mile watershed of rolling, wooded terrain. Fairview Reservoir has a surface area of about 102.0 acres and is aligned in an approximate north-south axis, with the main dam located at the most southerly point. Four dikes are located along the northern border of the impoundment with the

spillway outlet in the northwest corner. The dam, reservoir, and watershed are maintained as a standby water supply for the city of Norwich.

- b. Description of Dam and Appurtenances: Fair-view Reservoir Dam is an earth embankment with a masonry core wall and a vertical, gunited masonry wall covering the upper portion of the upstream face. The dam is 520.0 feet long and 28.0 feet in height with a top width of 27.0 feet, and crest elevation of 253.0 feet National Geodetic Vertical Datum (NGVD). The Northeast Dike, an earth embankment with a masonry core wall, is located at the northeast corner of the reservoir. The Northwest Dike, the Connection Dike, and Middle Dike form a continuous embankment at the northwest corner of the reservoir. These dikes are also earth embankments with masonry core walls. An access road runs along the entire crest of these dikes. The outlet spillway is located in the Northwest Dike section and consists of a concrete overflow broad crested weir 27.0 feet long, with a crest Elevation of 249.0. A canal near the spillway diverts flow from Byron Brook into the reservoir. Both the canal and the spillway

are spanned by bridge superstructures that support the reservoir access road.

An intake structure for the outlet works is located at the base of the upstream face of the main dam, in the approximate center of the embankment. There is a wooden bridge connecting the structure to the crest of the dam. Water is drawn into a submerged 14 inch copper pipe which leads to a flexible joint at the base of the intake structure. This section of pipe, with the aid of a cable and pulley system operated from inside the intake structure, was designed to be raised or lowered to allow intake from various water depths. This system is not operable at this time. A total of four cast-iron conduits pass through the main dam embankment. These consist of two 14 inch lines, one 10 inch, and one 8 inch diameter line. The layout and valving arrangement is clearly shown on two drawings in Appendix B-3. The valves located in the valve chamber at the downstream toe of the main dam embankment are inoperable and permanently open. Within the valve chamber the 4 conduits combine and increase to two 16 inch diameter lines. The

two 16 inch diameter conduits leading out of the valve chamber tie into the City water system and act as a standby source of water. The only method by which water can be released from the outlet conduits to the downstream channel is through a 4 inch diameter "blowoff" valve. Except for this "blowoff" valve, water passing through the conduits must enter the City water system through the chlorination plant. (See Photos C-5, C-6, C-7 and drawings of the outlet works in Appendix B).

- c. Size Classification: The dam is classified as INTERMEDIATE in size because the impoundment storage at the top of the dam is 1176 Ac-Ft.
- d. Hazard Classification: The dam is classified as a HIGH hazard structure because it is located where failure will cause damage to homes, public utilities, and highways, and may result in loss of life. See Appendix D for failure analysis.
- e. Ownership (past and present): Records indicate that Fairview Reservoir Dam was constructed about 1868 by its present owners, the Town of Norwich, Public Utilities Department.

- f. Operator: Operating personnel are under the direction of:

Mr. Humphrey Leary, Superintendent
Water Division
Town of Norwich
Public Utilities Department
Norwich, Connecticut
(203) 887-2555

- g. Purpose of Dam: The dam is used as a reserve and standby water supply for the City of Norwich.

- h. Design and Construction History: Records indicate the dam was constructed about 1868 by the City of Norwich. Several enlargements were made prior to 1902, when the dam, including the masonry core wall, was raised to its present crest elevation. In July, 1960, the original brick dome covering the valve chamber, or gate pit, at the downstream toe of the dam was removed and replaced by a reinforced concrete slab. The construction was accomplished by Zachae Brothers, General Contractors, of Norwich, Connecticut.

The dam was inspected by Chandler and Palmer, Civil Engineers, Norwich, Connecticut in May,

1963. They recommended the removal of trees on the upper slope of the downstream face.

Records show that the trees were removed. The original stone wall along the upper upstream face was repaired by a gunite application of grout around 1965. Several inspections of the dam have been made in the past decade and there has been concern about the condition of the outlet pipes, seepage through the core of the dam, and excess vegetation along the dikes. Any corrective action taken for these items has not been documented. Refer to Appendix B for copies of these previous inspection reports.

i. Normal Operational Procedures

There are no operational procedures specified for regulating the discharges from the reservoir. Water levels are controlled by the ungated spillway. Originally the reservoir was used as part of the main water supply for Norwich, but was changed to a standby supply upon completion of the Deep River Reservoir in 1973. The reservoir has not been used for the City water system since the spring of 1974.

The two outlet pipes (see the drawings in Appendix B-3) are tied into the City water system. Water from the two pipes must flow into the pump station and chlorination plant, before it enters the City system. The Norwich Department of Public Utilities, Water Division, monitors the reservoir water level once a week.

1.3 PERTINENT DATA

- a. Drainage Area: The Fairview Reservoir drainage basin, located in New London County in eastern Connecticut, is oval in shape with a length of about 6000 feet, a width of 4000 feet, and a total drainage area of 0.65 square miles (see Appendix D - Basin Map). The topography is generally rolling hills with the elevations ranging from a high of 380.0 feet to 249.0 feet at the spillway crest. Basin slopes are generally flat to moderate. There are some minor swampy areas in the watershed, however, there is very little attenuation. The time of concentration for the entire watershed area is relatively small so that all the surface runoff will peak simultaneously at the reservoir during a high intensity rainfall

event. Trespassing, fishing and swimming are prohibited at the reservoir and the area is intermittently patrolled by the City Water Department personnel. The main dam is fenced.

b. Discharge at Dam Site: There is no discharge data available for this dam. Listed below are discharge data for spillway and outlet works:

1. Outlet works (conduits) sizes 14 inch diameter copper pipe, 16-inch diameter cast iron pipe, 10-inch diameter cast iron pipe; Invert Elev. 220.0 ±.
2. Maximum known flood at damsite: unknown.
3. Overflow spillway capacity at maximum pool elevation (Top of Dam): 648 cfs @ Elev. 253.0.
4. Gated outlet capacity at normal pool elevation (spillway crest) of 249.0 is 70 cfs ±.
5. Gated outlet capacity at maximum pool elevation of 253.0 is 75.0 cfs ±.
6. Total discharge capacity at maximum pool elevation of 253.0 is 723 cfs ±.

c. Elevation (ft. above NGVD)

	<u>Dam</u>	<u>Dikes</u>
1. Top of Dam and Dikes	253.0	253±
2. Test flood pool elevation	253.66	253.66
3. Flood control pool	N/A	N/A
4. Recreation pool	N/A	N/A
5. Spillway crest		249.0

	<u>Dam</u>	<u>Dikes</u>
6. Upstream invert	Unknown	N/A
7. Streambed ds. at center- line of dam and dike	222.0 Est.	248.6
8. Recorded Maximum tailwater	N/A	Unknown
d. <u>Reservoir Lengths:</u> (feet)		
1. Length of maximum pool	6,000 ft.	
2. Length of recreation pool	N/A	
3. Length of flood control pool	N/A	
e. <u>Storage</u> (acre-feet) Total		
1. Water Supply pool (spillway crest)	768 @ Elev. 249.0	
2. Flood Control pool	N/A	
3. Test flood elevation	1247 @ Elev. 253.66	
4. Top of dam	1,176 @ Elev. 253.0	
5. Net storage between top of dam and spillway crest is 408 Ac.-ft. and represents 11.76 inches of runoff from the drainage area of 0.65 sq. miles		
6. One foot of surcharge storage equals 2.94 inches of runoff from the drain- age area of 0.65 sq. miles.		
f. <u>Reservoir Surface</u> (acres)		
1. Top dam	102 equals 25% of total drainage area.	

2.	Maximum pool	102
3.	Flood-control pool	N/A
4.	Recreation pool	N/A
5.	Spillway crest (Water Supply Pool)	102

g. Dam

1.	Type	earth dam, type of soil unknown
2.	Length	520.0 ft.
3.	Height	28.0 ft.
4.	Top Width	27.0 ft.
5.	Side Slopes	2H to 1V
6.	Zoning	Unknown
7.	Impervious Core	Masonry Core Wall
8.	Cutoff	Unknown
9.	Grout curtain	Unknown
10.	Other	Top 5 to 10 ft. of upstream face is masonry wall which has been gunited.

h. Dikes - Four auxiliary dikes

1.	Type	Earth embankments, type of soil unknown
2.	Length	Total length of all dikes is 735 feet (Estimated)
3.	Height	Varies from 7 to 10

- | | | |
|-----|-----------------|---|
| 4. | Top Width | 15 ft. |
| 5. | Side Slopes | US 2H to 1V
DS 1.5H to 1V |
| 6. | Zoning | Unknown |
| 7. | Impervious Core | Records indicate a
masonry core wall |
| 8. | Cutoff | Unknown |
| 9. | Grout Curtain | Unknown |
| 10. | Other | ---- |

i. Spillway

- | | | |
|----|-----------------|----------------------|
| 1. | Type | Overflow broad crest |
| 2. | Length of weir | 27.0 ft. |
| 3. | Crest elevation | 249.0 |
| 4. | Gates | None |
| 5. | U/S Channel | Natural bed |
| 6. | D/S Channel | Natural bed |
| 7. | General | ---- |

j. Regulating Outlets

Refer to Paragraph 1.2b "Description
of Dam and Appurtenances" Page 3
for description of outlet works.

- | | | |
|----|-------------------|--|
| 1. | Downstream Invert | 206.0 (est) |
| 2. | Size | Two 16-inch diameter
pipes connected by a
10-inch diameter
crossover pipe |
| 3. | Description | Cast iron pipe |

4. Control Mechanism

Gate valve at pumping station and chlorination plant on 10 inch pipe

5. Other

Four inch "blowoff" valve may be used to release water downstream. The 16 inch diameter lines connect to the City water system, but valves are maintained in closed position to keep unchlorinated water separate from chlorinated water.

SECTION 2
ENGINEERING DATA

2.1 DESIGN

A design drawing of the main dam showing the outlet works, dated 1868, a set of undated drawings showing the raising of the main dam, and a plan and profile for the auxiliary dikes, are available. Copies of the drawings are in Appendix B.

2.2 CONSTRUCTION: No record of construction or repairs exist.

2.3 OPERATION: No record of operation for this facility have been maintained.

2.4 EVALUATION:

- a. Availability: There are no plans, specifications or computations available from the Owner, County or State offices regarding the design, construction or subsequent repairs for this dam.
- b. Adequacy: The lack of in depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

- c. Validity: The validity of the limited data must be verified.

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

a. General: Based on visual inspection and general appearance, the main dam and the four auxiliary dikes for Fairview Reservoir are in fair condition but lacking in maintenance. Several seepage areas near the toe of the main dam suggest that flow through the masonry core wall could be taking place. Color of seepage flow at the time of inspection was clear. Evidence of a slide area is present near the valve chamber, apparently resulting from the renovation of the chamber in July, 1960. The gate valves in the chamber are frozen in the open position and water is seeping through the roof. Numerous stumps and shrubs are present on the downstream face of the main dam, and heavy vegetation was observed covering all the dikes, inhibiting proper inspection of those appurtenances.

b. Dam and Dikes

1. Main Dam

On the downstream face of the dam there is evidence of an old embankment slide

that apparently occurred when the valve house was renovated in 1960. Photograph C-6 shows the outlines of the slide. It occurred on the downstream half of the slope and occupied about half the length of the toe of the downstream slope. Water is now seeping into the roof of the buried valve chamber which is located approximately in the center of the slip zone. The individuals who saw the slide described the material as silt.

To the left of this slide zone, about 10 feet above the toe and about 15 feet to the right of the left abutment, there is also a small slump zone. This slump is situated just above a zone where seepage is exiting from the intersection between the downstream toe and the left abutment. This seepage creates a soft, wet area (See Photo C-9). The seeping water appears to be clear.

A second soft or wet zone occupying about 40 sq. feet in area was found about 50 feet downstream from the toe near the right abutment.

Numerous low shrubs and stumps are present on the downstream face, as shown in Photograph C-8.

At both ends of the dam, the gunited stone wall on the upstream face of the dam shows some horizontal misalignment. The top of the wall curves slightly upstream at locations approximately 100 to 150 feet from each abutment. Along the center section of the dam the stone wall appears to be straight. The horizontal misalignments are illustrated in Photographs C-2 and C-3.

The top of this wall also has one area of depression, approximately 100 to 150 feet from the right abutment as illustrated in Photograph C-3.

Two shallow linear depressions 0.2 to 0.4 feet deep were found on the crest and parallel to the upstream and downstream crestlines. They extend along most of the crest length at a distance of about four feet from their respective crestlines. The cause of these depressions is not known.

2. Dikes

There are four auxillary dikes - the Northwest Dike, the Connection Dike, the Middle Dike, and the Northeast Dike - all at the north end of the reservoir as illustrated in Appendix C - Photo Index. All four dikes appear to be earth embankments.

One wet area was observed downstream of the toe of the Connection Dike, near the outlet structure. See Photo C-14

One 12-inch diameter animal burrow was observed in the downstream face of the Connection Dike, near the intake structure.

No other areas of seepage or "burrow" animal activity were observed in the four dikes, however, inspection was difficult because of the very heavy growth of vegetation on the dikes.

Both the upstream and downstream faces of all four dikes are covered with heavy brush, shrub and tree growth. The downstream faces contain numerous large trees and stumps up to 18-inches in diameter. The upstream faces generally

have dense shrubs and trees up to 10 feet high, although one 10-inch diameter cedar was observed on the upstream slope of the Northeast Dike.

c. Appurtenant Structures:

1. Valve Chamber - Water was observed seeping through the roof of the buried valve chamber on the main dam. The gate valves and pipes are very corroded and the valves are frozen in the open position.
2. Intake Structure - The intake structure at the main dam is in poor condition and shows signs of vandalism. The wooden access bridge to the structure is in disrepair with some missing planks.
3. Spillway - The spillway at the opposite end of the reservoir is constructed of mortared rubble masonry and is in fair condition with some seepage occurring from below the spillway crest on the downstream side. Heavy vegetation surrounds the spillway with some debris obstructing the discharges from that structure.
4. Inlet - The inlet structure, in the Connection Dike, is a structure supporting a

concrete roadway deck with walls and appears to be in fair condition.

- d. Reservoir: No specific detrimental features in the reservoir area were observed during the visual inspection. The slopes of the watershed are fairly gentle and heavily wooded. The elongated shape of the reservoir creates a long fetch for certain wind directions which could cause significant wave heights at the main dam.
- e. Downstream Channel: The channel downstream of the main dam is dry, covered with grass and bounded by overhanging trees.

The overflow outlet structure for the reservoir is located in the Connection Dike. The first 10 feet of the downstream channel for that structure is covered with a riprap apron. Further downstream, the channel is a natural stream bed with many overhanging trees.

3.2 EVALUATION

Visual observation made during the course of the inspection indicated several conditions that require attention. Several of the deficiencies observed and discussed above and should be corrected before further

deterioration develops a hazardous condition. Recommended measures are discussed in Section 7. In general, the visual inspection indicates that the dam is in FAIR condition and that the maintenance of the dam and its appurtenances has been intermittent only.

SECTION 4
OPERATIONAL PROCEDURES

4.1 PROCEDURES

a. Normal Operating Procedures

Fairview Reservoir is presently used as a standby water supply for the City of Norwich. Water levels are uncontrolled above the outlet spillway crest and regulated below that level by the outlet works. The outlet conduits are open and under pressure from the intake structure, through the main dam embankment to the pumping station where the valves are closed until water is needed to supplement the City water supply. The most recent use of the facility occurred in the spring of 1974.

b. Emergency Operating Procedures

No formal emergency procedure for the operation or regulation of the water level was apparent for critical periods or emergency situations.

4.2 MAINTENANCE OF THE DAM

The crest and downstream face of the main dam are periodically cleared of high grass and brush by employees of the water division of the Norwich Department of

Public Utilities. The auxillary dikes however are lacking in any maintenance and are overgrown with large trees and brush. No other maintenance evidence was observed.

4.3 MAINTENANCE OF THE OPERATING FACILITIES

The Department of Public Utilities regularly checks the water level behind the dam and maintains the equipment and valves at the pumping station. The pumping station and chlorination plant, including the surrounding grounds appear to be well maintained. However, other sections of the reservoir such as: the intake structure, the valve chamber, and the outlet spillway all seem to be lacking any regular care, and are in poor condition. The access road along the dikes is excessively overgrown with trees and brush and would inhibit quick access to sections of the reservoir in case of emergency.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

Impending storm activity is monitored by the water department personnel through local broadcasts or direct communication with the weather service during periods of high reservoir stage and approaching storm activity. No formalized "action plan" to reduce water levels or notify personnel to reduce or prevent critical situations or contact Civil Defense authorities was arparent.

4.5 EVALUATION

The overall condition of the dam is FAIR but maintenance of the dam and its appurtenances varies greatly. The pumping station and chlorination plant, and parts of the main dam appear to be maintained satisfactorily, while the less visible appurtenances receive almost no maintenance. There is no definitive contingency plan for emergency situation.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. Design Data: No specific design data is available for the structures of Fairview Reservoir. In lieu of existing design information, the USGS topographic map (Norwich quadrangle-scale 1" = 2000') was used to a great extent to develop hydrologic parameters such as drainage area, basin slope, reservoir surface area runoff characteristics and time of concentration. Inflow and outflow discharges were developed using Corps of Engineers' criteria assuming the initial reservoir level at the spillway crest elevation (see Appendix D). A "Test Flood" equal to the Probable Maximum Flood (PMF) was calculated to be 2500 csm, equal to 1625 cfs for a drainage area of 0.65 sq. miles. Surcharge storage was approximated assuming that the surface area remained constant above the spillway crest. Elevation-storage relationships for the reservoir were also approximated.

Fairview Reservoir Dam was classified as being INTERMEDIATE in size having a storage

capacity of 1176 Ac-Ft. at the top of dam. To determine the hazard classification for this dam, the impact of its failure at maximum pool (top of dam) was assessed. As a result of the analysis, Fairview Reservoir Dam was classified as a HIGH hazard structure as detailed in Appendix D. The dam failure discharge was computed as 20,500 cfs (See Appendix D) and an approximate dam failure profile developed. It is estimated that the failure discharge of 20,500 cfs will flow at a depth of approximately 8 feet near the intersection of Scotland Road and Canterbury Turnpike. Additional design data developed for this investigation is as follows:

INFLOW, OUTFLOW AND SURCHARGE DATA

FREQUENCY IN YEARS	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* EFFEC- TIVE RAINFALL IN INCHES	MAXIMUM INFLOW IN C.F.S.	MAXIMUM** OUTFLOW IN C.F.S.	SURCHARGE HEIGHT IN FEET	SURCHARGE STORAGE ELEVATION
10	5.0	2.6	153	24	0.45	249.45
50	6.5	4.1	240	49	0.70	249.7
100	7.0	4.6	370	58	0.80	249.8
1/2 PMF	11.9	9.5	812	165	1.61	250.61
TEST FLOOD = PMF.	21.4	19.0	1625	1356	4.66	253.66

*Infiltration assumed as 0.1"/hour

**Lake assumed initially full at spillway crest elevation 249.0.
(Top of dam = 253.0).

NOTES:

1. $Q_{10}; Q_{50}; Q_{100}$; inflow discharges were computed by the approximate methodology of the Soil Conservation Service.
2. 1/2 PMF and "test flood" computations were based on COE guidelines.
3. The maximum capacity of the spillway without overtopping the top of the dam (Elev. 253.0) is equal to 648 C.F.S.
4. All discharges indicated in the table above are dependent upon the continued integrity of upstream storage reservoirs.
5. Surcharge storage is allowed to overtop the dam when exceeding the spillway capacity.

Test Flood = PMF = 2500 csm = 1625 cfs (D.A. = 0.65 sq. M).

b. Experience Data: There is no data available for any historical flooding events experienced at Fairview Reservoir.

c. Visual Observations

1. There is seepage underneath the spillway channel and at the spillway training walls.
2. The downstream spillway channel is overgrown with vegetation decreasing its discharge capacity.
3. The outlet control structure is inoperable and should be restored or modified in order to control the outflow from the reservoir on the upstream side of the embankment. The wooden access bridge to this structure is in poor repair and should be replaced.
4. The pressure conduit through the dam is virtually uncontrolled until it reaches the vicinity of the pumping station. These discharge lines are old, as observed in the valve pit, and documented on the available drawings, and any leak or failure of these pipes could cause potential failure of the embankment.
5. The valve chamber is in need of maintenance with rusted pipes and valves. This chamber has standing water on the floor indicating a nonfunctioning floor drain.

6. The dikes and the dam are subject to overtopping by the Test Flood by 0.66 ft. as well as floods of lesser magnitude accompanied by wind and wave action.

d. Overtopping Potential

The spillway is hydraulically inadequate to pass the "test flood" (PMF) and would overtop the dam approximately 0.66 feet (refer to Table on Page 24). The maximum outflow capacity of the spillway is 648 cfs; sufficient to contain the 100-year flood event within the spillway training walls with some allowance for freeboard. The spillway capacity represents 47.8% of the test flood. The test flood will produce an approximate water surface Elevation of 240.0 immediately downstream from the dam. This failure discharge will also produce a water surface approximately 8 ft. in depth near Scotland Road.

SECTION 6
STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation

There were no signs of structural instability evident. The inspection did disclose evidence of a past landslide and of a small slump area in the main dam, as discussed in Section 3.1.

b. Design and Construction Data

No data is available and an evaluation cannot be made.

c. Operating Records

No operating records are available relating to geotechnical or structural aspects of the dam or the associated dikes.

d. Post-Construction Changes

Between 1902 and 1905, the crest of the main dam was raised approximately 4 feet and the dikes were constructed at the north end of the reservoir.

Around 1960, the valve chamber on the downstream face of the main dam was renovated. A small landslide occurred around the site of the valve chamber reportedly during this renovation.

Large evergreen trees were allowed to grow on the downstream face of the main dam as indicated in a Chandler and Palmer inspection report in 1963. Subsequently, these trees were cut, leaving stumps that are now rotting and are creating a potential hazard.

e. Seismic Stability

The dam is located in seismic zone No. 1 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition: Based on the visual inspection, limited available records and past operational performance, Fairview Reservoir Dam and its appurtenances is considered to be in FAIR condition. The following areas of concern must be corrected in order to assure that this facility remain functional and in operating condition over a long term.
1. The spillway will not pass the "test flood" (PMF) without overtopping the dam, and therefore the present spillway capacity is inadequate.
 2. An inadequate freeboard allowance for intense wind generated wave action out of the north or south quadrants could result in overtopping of the dam or dikes and could lead to potential failure if not corrected.
 3. The slide area around the valve chamber, small slump zones near the abutments, and seepage into the roof of the valve chamber are indications that water is flowing through the

masonry core wall of the main dam. An increase in this flow due to higher reservoir levels or continued deterioration of the core wall could produce more seepage, erosion, and lead to internal piping and additional deterioration of the downstream face, jeopardizing the stability of the dam.

4. The outlet conduits as observed in the valve chamber are corroded, are not controlled on the upstream side of the dam, and are constantly under pressure. A leak in any of these pipes in the embankment has the potential of causing the failure of the dam.

5. The roots of rotting tree stumps and brush provide pathways for internal erosion on the main dam and the dikes, which could increase the potential for piping failures. This problem is more acute on the dikes due to the heavier growth of trees and brush and the relatively small size of the embankments. The vegetation also hinders further inspection and detection of any signs of increased or new seepage or erosion.

6. Seepage from beneath the spillway could jeopardize the integrity of that structure if allowed to continue.

7. Vegetation and debris obstructing the spillway outlet channel decreases the discharge capacity.

8. The valve chamber and intake structure have been abandoned. Their present condition is deteriorating.

- b. Adequacy of Information: The information available for this dam is such that the assessment for this structure must be based primarily on the visual inspection.
- c. Urgency: The recommendations and remedial measures described below should be implemented by the Owner within a one year period after receipt of this Phase I inspection report.
- d. Need for Additional Investigation: Although there is only limited evidence that formal engineering analyses and drawings were developed for this dam at the time of its construction, it is considered important that current data be collected. The visual inspection and operational history indicate that particular attention be given to the collection of new engineering data in order that the recommendations listed below in Section 7.2 and 7.3 may be carried out.

7.2 RECOMMENDATIONS

Engage the services of an engineer experienced in the design of earth dams to accomplish these recommendations.

- a. Analyze and upgrade the spillway capacity and freeboard requirements with respect to the "test flood" criteria.
- b. Design a seepage monitoring and collection system to obtain sufficient data to effectively evaluate and control the seepage flows.
- c. The stability of the downstream slope should be analyzed, and necessary corrective measures taken. Borings and water level measurements within the embankment are required for this analysis.
- d. Implement a program for removal of tree stumps and roots on the downstream face of the main dam, along with appropriate backfilling procedures. Develop a regular program to keep the structures clear of excess vegetation.
- e. Consider the renovation or replacement of the intake structure with a structure that will provide control of the outlet conduits from the upstream side of the dam. Initially, the wooden access bridge to the existing structure should be repaired and the structure secured to discourage vandalism.

- f. Eliminate the problem of seepage in the valve chamber located at the downstream toe of the dam. Consideration may be given to filling the chamber with suitable material or completely eliminating or redesigning it.
- g. Determine the cause of and correct the seepage occurring beneath the spillway and repair the deteriorated spillway.

7.3 REMEDIAL MEASURES

- a. Operating and Maintenance Procedures: While the dam has had some maintenance, it is considered important that the following be accomplished.
 - 1. Develop and commence a regular maintenance and inspection schedule for the facility.
 - 2. Incorporate in the above program monitoring of the seepage and examination of the tree stumps on the slopes. Once a procedure has been developed for the removal of the trees, incorporate this procedure into the regular maintenance program.
 - 3. Develop a system for the recording of data with regard to items such as: water levels, discharges, time and drawdown to

assist those responsible for the monitoring of the structure.

4. Continue the technical periodic inspections of this facility on an annual frequency.
5. Prepare an "Emergency Action Plan" to prevent or minimize the impact of failure, listing the expedient action to be taken and authorities to be contacted.
6. Because of the concerns for this dam including the potential for overtopping, and the limited data available, a round the clock surveillance should be instituted during periods of high intensity rainfall and high reservoir stages. A formal warning system should be developed for use in the event of an emergency. Clear the floor drain and monitor the seepage in the valve chamber.
7. Clear and improve the access road to the dike and appurtenances of the facility for better maintenance and emergencies.
8. Clear the vegetation from the dike slopes and crest, the spillway, and the downstream channel.

7.4 ALTERNATIVES

- a. As an alternate to the recommendations to upgrade the structure as listed above, the water surface level in Fairview Reservoir should be lowered and maintained at a level well below the spillway crest. That reduced level should be regulated in order to provide flood storage for storm events.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Fairview Reservoir Dam

DATE 19 June 1978

TIME 0900 to 1600

WEATHER Clear, Hot, Humid

W.S.ELEV. _____ U.S. _____ D.S.

PARTY :

- | | |
|---------------------------|--------------------------------------|
| 1. <u>R. Long - CEM</u> | 6. <u>S. Poulos - GEI</u> |
| 2. <u>A. Reed - CEM</u> | 7. <u>J. France - GEI</u> |
| 3. <u>S. Khanna - CEM</u> | 8. <u>H. Leary - City of Norwich</u> |
| 4. <u>R. Brown - CEM</u> | 9. _____ |
| 5. <u>R. Valles - CEM</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. _____		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT FAIRVIEW RESERVOIR DAM DATE June 19, 1978
Main Dam DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DAM ENBANKMENT-MAIN DAM</u>	
Crest Elevation	253.0 M.S.L.
Current Pool Elevation	249.3 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement
Movement or Settlement of Crest	Gravel and grass road on crest-two 0.2-0.4 ft deep line depressions parallel to upstream and downstream crestlines: One approx 3 ft from upstream crestline; one approx 6 ft from downstream crestline
Lateral Movement	6 ft from downstream crestline
Vertical Alignment	See horizontal alignment
Horizontal Alignment	A depression exists in the stone wall and the steel fence on upstream crestline to left of right abutment
Condition at Abutment and at Concrete Structures	Horizontal upstream curvature of top of stone wall at upstream face, near both ends of the dam
Indications of Movement of Structural Items on Slopes	Right and left abutments in good condition dry, no erosion. Large trees high on left embankment. No indication of movement of valve house
Trespassing on Slopes	None observed
Sloughing or Erosion of Slopes or Abutments	No erosion observed at abutments. On downstream face a few areas were observed with no cover silty fine sand soil. Shallow erosion channels observed on downstream face

PERIODIC INSPECTION CHECK LIST

PROJECT FAIRVIEW RESERVOIR DAM DATE June 19, 1978
Main Dam DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
Rock Slope Protection-Riprap Failures	Upstream face is grouted stonewall
Unusual Movement or Cracking at or near Toes	Old landslide area behind valve house near toe of downstream face. Apparent small slip near seepage area
Unusual Embankment or Downstream Seepage	One seepage area at toe of downstream slope near left abutment. Very wet but no running stream
Piping or Boils	None observed
Foundation Drainage Features	None apparent
Toe Drains	None apparent or known
Instrumentation System	None apparent or known
Vegetation	Downstream face many low shrubs up to 2 ft high, many rotten stumps up to 20-in in diameter. Crest-grass covered-no shrubs or trees.Upstream face-not observed-underwater

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Northwest Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	253.0 M.S.L.
Current Pool Elevation	249.3 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement. Grass and sand road on crest
Movement or Settlement of Crest	None observed
Lateral Movement	Too irregular to be discernible
Vertical Alignment	Too irregulat to be discernible
Horizontal Alignment	Too irregular to be discernible
Condition at Abutment and at Concrete Structures	Left abutment and contact at intake structure are in good condition
Indications of Movement of Structural Items on Slopes	No structural items on slopes
Trespassing on slopes	None observed
Sloughing or Erosion of Slopes or Abutments	None observed but observation was difficult due to heavy vegetation
Rock Slope Protection-Riprap Failures	Riprap on upstream face in good condition
Unusual Movement or Cracking at or near Toes	None observed but observation was difficult due to heavy vegetation
Unusual Embankment or Downstream Seepage	None observed but observation was difficult due to heavy vegetation
Piping or Boils	None observed
Foundation Drainage Features	None apparent
Toe Drains	None apparent
Instrument System	None apparent

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Northwest Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<p><u>DIKE EMBANKMENT</u></p> <p>Vegetation</p>	<p>Downstream face-heavy young cherry undergrowth and many full grown trees and stumps to 18 in size. Upstream face-dense shrubs and trees up to 10 ft high</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Middle Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	253.0 M.S.L.
Current Pool Elevation	249.3 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement. Grass and sand road on crest
Movement or settlement of crest	None observed
Lateral Movement	Too irregular to be discernible
Vertical Alignment	Too irregular to be discernible
Horizontal Alignment	Too irregular to be discernible
Condition at Abutment and at Concrete Structures	Left and right abutments are in good condition. No concrete structures
Indications of Movement of Structural Items on Slopes	No structural items on slopes
Trespassing on Slopes	None observed but observation was difficult due to heavy vegetation
Sloughing or Erosion of Slopes or Abutments	None observed but observation was difficult due to heavy vegetation
Rock Slope Protection-Riprap Failures	Riprap on upstream face in good condition
Unusual Movement or Cracking at or near Toes	None observed but observation was difficult due to heavy vegetation
Unusual Embankment or Downstream Seepage	None observed but observation was difficult due to heavy vegetation
Piping or Boils	None observed
Foundation Drainage Features	None apparent
Toe Drains	None apparent

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Middle Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u> Instrumentation System Vegetation	None apparent Downstream face-heavy young cherry undergrowth and many full grown trees and stump to 18-in diameter. Upstream face-dense shrubs and trees up to 10 ft high

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Connection Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	253.0 M.S.L.
Current Pool Elevation	249.3 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement. Grass and sand road on crest
Movement or Settlement of Crest	None observed
Lateral Movement	Too irregular to be discernible
Vertical Alignment	Too irregular to be discernible
Horizontal Alignment	Too irregular to be discernible
Condition at Abutment and at Concrete Structures	Contacts at intake and outlet structures are in good condition. Right abutment in good condition
Indications of Movement of Structural Items on Slopes	No structural items on slopes
Trespassing on Slopes	One 12-in diameter animal hole near contact with the intake structure.
Sloughing or Erosion of Slopes or Abutments	None observed but observation was difficult due to heavy vegetation
Rock Slope Protection-Riprap Failures	Riprap on upstream face in good condition
Unusual Movement or Cracking at or near Toes	None observed but observation was difficult due to heavy vegetation
Unusual Embankment or Downstream Seepage	One wet spot observed near downstream toe, left of outlet structures
Piping or Boils	None observed
Foundation Drainage Features	None apparent
Toe Drains	None apparent

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Connection Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<p><u>DIKE EMBANKMENT</u></p> <p>Instrumentation System</p> <p>Vegetation</p>	<p>None apparent</p> <p>Downstream face-heavy young cherry undergrowth and many full size trees and shrub to 18-in in diameter. Upstream face-dense shrubs and trees up to 10 ft high</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Northeast Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Crest Elevation	253.0 M.S.L.
Current Pool Elevation	249.3 M.S.L.
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement. Grass and sand road on crest
Movement or Settlement of Crest	None observed
Lateral Movement	Too irregular to be discernible
Vertical Alignment	Too irregular to be discernible
Horizontal Alignment	Slightly arched downstream
Condition at Abutment and at Concrete Structures	Left and right abutments in good condition No concrete structures
Indications of Movement of Structural Items on Slopes	No structural items on slopes
Trespassing on Slopes	None observed but observation was difficult due to heavy vegetation
Sloughing or Erosion of Slopes or Abutments	None observed but observation was difficult due to heavy vegetation
Rock Slope Protection - Riprap Failures	Riprap on upstream face in good condition
Unusual Movement or Cracking at or near Toes	None observed but observation was difficult due to heavy vegetation
Unusual Embankment or Downstream Seepage	Ground downstream of dike is wet but there is no evidence of moving water. Some stagnant pools of reddish brown water were observed near the toe.
Piping or Boils	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
Northeast Dike DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	
Toe Drains	None apparent
Instrumentation System	None apparent
Vegetation	Downstream face-heavy young cherry undergrowth and many full grown trees and stumps to 3 ft diameter. Upstream face-de shrubs and trees up to 10 ft. high one 10-in diameter cedar.

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Flat
Bottom Conditions	Natural stony bed, heavily overgrown
Rock Slides or Falls	None
Log Boom	None
Debris	Brush, trees, stones
Condition of Concrete Lining	Not applicable
Drains or Weep Holes	Not applicable
b. Intake Structure	
Condition of Concrete	Concrete deck on rubble grouted masonry walls
Stop Logs and Slots	None

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
 INSPECTOR _____ DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u> a. Concrete and Structural General Condition Condition of Joints Spalling Visible Reinforcing Rusting or Staining of Concrete Any Seepage or Efflorescence Joint Alignment Unusual Seepage or Leaks in Gate Chamber Cracks Rusting or Corrosion of Steel b. Mechanical and Electrical Air Vents Float Wells Crane Hoist Elevator Hydraulic System Service Gates Emergency Gates Lightning Protection System Emergency Power System Wiring and Lightning System	Not applicable

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u> General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	Not applicable

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dams DATE June 19, 1978
 INSPECTOR _____ DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>Not applicable</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dam DATE June 19, 1978
 INSPECTOR _____ DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	Straight natural stony bed
General Condition	Fair to good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Many trees on shoreline
Floor of Approach Channel	Riprap, weeds, and brush
b. Weir and Training Walls	Grouted rubble masonry
General Condition of Concrete	Fair to good
Rust or Staining	None observed
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Seepage occurring under spillway crest
Drain Holes	None
c. Discharge Channel	
General Condition	Poor
Loose Rock Overhanging Channel	Yes
Trees Overhanging Channel	Many trees overhanging channel
Floor of Channel	50 to 100 lb. stone downstream of spillway for 10 ft followed by natural streambed, obstructed by debris
Other Obstructions	Vegetal growth

PERIODIC INSPECTION CHECK LIST

PROJECT Fairview Reservoir Dam DATE June 19, 1978
 INSPECTOR _____ DISCIPLINE _____
 INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	Timber access bridge weathered, poor condition. Rusted, planks missing.
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	Fair to Good
Condition of Seat & Backwall	

APPENDIX B

1. Listing of Locations for Available Correspondence Data
2. Copies of Past Inspection Reports
3. Plans, Sections, Details

APPENDIX B-1

1. Victor J. Galgowski, Dam Safety Engineer
Department of Environmental Protection
State Office Building
165 Capital Avenue
Hartford, Connecticut 06115
2. Humphrey Leary, Superintendent
Water Division
Department of Public Utilities
P.O. Box 1008
34 Shetucket Street
Norwich, Connecticut 06361

APPENDIX B-2

1. April 2, 1969 Letter-State to Norwich
D.P.W.-results of inspection of
dam.
2. Feb. 5, 1969 Letter-State to Norwich
D.P.W.-report on inspection of
dam.
3. Feb. 3, 1969 Memo (State to Pelletier-report
on inspection of dam.
4. Jan. 28, 1969 Inventory data for dam 4A and
4B (dikes)-Water Resources
Commission.
5. Feb. 15, 1968 Memo-Pelletier (Water Resources
Commission-report of dam in-
spection.
6. Feb. 14, 1968 Letter-Chandler & Palmer to
City-report of dam inspection.
7. Oct. 27, 1965 Memo-Norwich D.P.W.-inpsction
and repairs to dam.
8. May 10, 1965 Letter-Chandler & Palmer-dam
condition.
9. Sept., 1964 Inventory Data-Water Resources
Commission.
10. June 17, 1963 Letter-Chandler & Palmer to
Norwich D.P.W.-results weekend
inspection.
11. May 20, 1963 Letter-Chandler & Palmer to
Norwich D.P.W.-results weekend
inspection.
12. Sept. 23, 1960 Memo-Norwich D.P.W.-condition
of dam.

April 2, 1969

Mr. Robert Grimshaw
General Manager
Department of Public Utilities
P. O. Box 1008
(34 Shetucket Street)
Norwich, Connecticut 06362

Subject: Fairview Reservoir Dam
Norwich

Dear Mr. Grimshaw:

On March 26, 1969, the undersigned inspected the subject dam with your Mr. Leary and Mr. Parsons.

The wet area below the downstream slope persists, but there was no indication that this would endanger the structure. According to Mr. Leary, this area is occasionally dry which may indicate sensitivity to the water surface elevation of the reservoir.

We are currently reviewing the plans from Chandler and Palmer's office, given to us on March 26, 1969, and will contact you in the near future.

Very truly yours,

William H. O'Brien III
Civil Engineer

WHDII:vhb

February 5, 1969

Mr. Robert E. Grimshaw, General Manager
Department of Public Utilities
P. O. Box 1008
(34 Shetucket Street)
Norwich, Connecticut

Subject: Fairview Reservoir Dam
Norwich

Dear Mr. Grimshaw:

On January 28, 1969, the undersigned, in the company of your Superintendent, Mr. Humphrey Leary, inspected the subject dam.

The dikes at the north end of the dam are in need of some maintenance and will be covered in a subsequent letter on the nine dams you requested to have inspected. *(see memo in this file dated Feb 3, 1969)*

The main dam appeared to be in satisfactory condition in that there is insufficient evidence to conclude otherwise. However, there has been some concern about the pipes through this dam and seepage through the core wall, and there is a wet area below the downstream toe of the dam on the east side. Also, some work has been done on this dam without a Construction Permit. The Water Resources Commission has obtained some plans of this dam from your office and purchased more from Chandler & Palmer, Engineers, Norwich, none of which depict the existing structure. Because of the foregoing and our desire to further study the safety of this dam, we request that you supply us with the following:

1. A set of "as-built" plans detailing the existing dam and appurtenances, in plan and cross sections.
2. Copies of all reports, plans and specifications prepared by Buck, Seifert and Jost with their conclusions as to the safety of the dam and appurtenances with a description of the work done in 1960.
3. A listing and description of work performed on this dam to be prepared by Chandler & Palmer, Engineers, Norwich, with cross references to plans prepared by Chandler & Palmer which were

Copy of this letter is being
forwarded to the State of Connecticut

Robert Grimshaw, Norwich
Fairview Reservoir Dam

February 5, 1969

supplied and billed to us by this firm. These plans are generally
undated and apparently show various proposals for raising the dam,
none of which depict the existing structure.

We would appreciate this information at your earliest convenience.

Very truly yours,

William H. O'Brien, III
Civil Engineer

WHD:IVB



STATE OF CONNECTICUT

WATER RESOURCES COMMISSION

STATE OFFICE BUILDING • HARTFORD, CONNECTICUT 06115

February 3, 1969

Memo to: Charles J. Pelletier, Division Engineer

From: William H. O'Brien III

Subject: Fairview Reservoir Dam - Norwich

On January 28, 1969; the undersigned inspected the subject dam in the company of Mr. Humphrey Leary, Superintendent, Water Division, Town of Norwich, Public Utilities Department, owners of the dam.

There are two dikes and one dam on this reservoir.

1. The Northeast Dam (or dike) is an earth dike with a masonry core wall. There are numerous large trees growing on the downstream side of this dike and one cedar on the upstream side which should be removed. The elevation of the natural ground downstream of this dike is approximately 4 feet below full pond.

2. There is one continuous dike at the northwest corner of the reservoir composed of 3 sections known as (from west to east) the Northwest Dam, the Connection Dam and Middle Dam. This could be considered as one dike or dam. In the Northwest Dam section, there is both an inlet and the outlet for the reservoir. The roadway on the top of the dike crosses each by a bridge. (see sketch on reverse of inventory sheet). The masonry training wall on the pond side of the outlet structure, and the concrete training wall on the pond side of the inlet structure have both been damaged, apparently by ice pressure. They should be repaired and fill placed to the top of these walls. There are also numerous trees growing on and too close to the dike on the downstream side and some brush in the outlet channel, all of which should be removed.

3. Main Dam - There was an area immediately below the toe of the dam on the east side which was wet and somewhat mushy (not completely frozen). It appeared the same as observed on February 14, 1968. There were no leaks observed and the toe of the dam itself in this area showed no evidence of seepage and was not mushy at all. This wet spot below the dam has existed without change according to Mr. Leary, at least since 1960 when he became general foreman. In 1960, Buck, Seifert and Jost, engineers from New York, made certain recommendations concerning the valve house on the downstream side of the dam. At that time, there was a brick arch top on the manhole with a man-hole cover in the center which was under approximately five feet of earth. This was covered and a downstream entry-way was constructed with a door apparently at the time the dam was raised.

February 3, 1969

Buck, Seifet and Jost apparently felt that if a leak or rupture developed in the valve house, the brick arch roof would be the point of failure, possibly causing a slide in the downstream face of the dam. In order to reinforce the roof, they excavated an area about 30 feet in diameter around the valve house. Reinforcing mesh was placed over the brick and concrete poured over this.

According to Mr. Leary, the excavated material was a brownish yellow clay. Sheet piling used on the upper (deepest) part of the excavation and this caved in, apparently caused by a localized surface slide of the downstream embankment requiring localized restoration up to about half the height of the dam.

The undersigned spent over an hour with Mr. Joseph Marra who worked for the Public Utilities Department from 1933+ to 1964+, the last 16 years of which time was spent at this reservoir. Mr. Marra has voiced concern over this dam and his concern seemed to center around two main points.

1. He claims that the pipes through the dam were considered to be thin by the engineers of Buck, Seifet and Jost and this is why they suggested reinforcement of the roof of the valve house.

2. He claims that the clay was very saturated and flowing in the excavation for this work, and that Buck, Seifet and Jost's conclusion was that there was excessive seepage through the core wall.

All valves in the gate house are rusted in an open position and inoperable.

Mr. Leary claims that the pipes through the dam placed in 1868 are the same quality and placed at the same time as some of the feeder mains which their consultants claim can be used for up to 150 P.S.I., whereas the pipes at the dam are only under about 15 P. S. I. There are instances of cast iron pipe in satisfactory use for much greater periods than 100 years.

There are no doubt cracks in the masonry core wall allowing seepage through it, but visual inspection and walking along the toe of the dam indicates that such seepage does not emerge on the downstream slope of the dam. There does not appear to be sufficient evidence at this time to conclude that the dam is unsafe. The water level was down 4' 10" from full pond at the time of inspection. Mr. Leary was asked to inform us when the frost had left the ground and also when the pond was full, so that we might inspect it at these times to see if there was any change in the seepage below the dam.

Recommend requesting the Public Utilities Department, Town of Norwich, to supply us with the following:

1. As-built plans of existing dam and appurtenances. This will require a survey since plans in this office obtained from the town and from Chandler and Palmer do not depict the existing structure, apparently raised in 1910-1911.

February 3, 1969

2. Copies of all reports, plans and specifications prepared by Buck, Seifert and Jost with their conclusions as to the safety of the dam and appurtenances with a description of work done in 1960.

3. A history and description of work performed on this dam to be prepared by Chandler and Palmer, Engineers, Norwich, with cross-references to plans prepared by Chandler and Palmer which were supplied and billed to us by this firm. These plans are generally undated and apparently show various proposals for raising the dam, none of which depict the existing structure.

William H. Brown, Jr.
Civil Engineer

WHOIII:vhb

No. _____ WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Inventoried
By W. H. O'Brien

Date 1/28/69

Name of Dam or Pond Northeast Dam (or Dike) at Fairview Reservoir

Code No. T14755.5 B2.2 U0.4

Nearest Street Location Connecticut Turnpike

Town Norwich

U.S.G.S. Quad. Norwich

Name of Stream Bobbin Mill Brook

Owner Town of Norwich Public Utilities Dept.

Address 34 Shetucket St.

(ENTER TOP OF DRIVEWAY WEST OF
PROPERTY LINE)

Pond Used For water supply

Dimensions of Pond: Width _____ Length _____ Area _____

Total Length of Dam _____ Length of Spillway NONE

Location of Spillway NONE

Height of Pond Above Stream Bed 7.5 ft. ±

Height of Embankment Above Spillway full pond = 4' ±

Type of Spillway Construction _____

Type of Dike Construction earth with masonry core wall

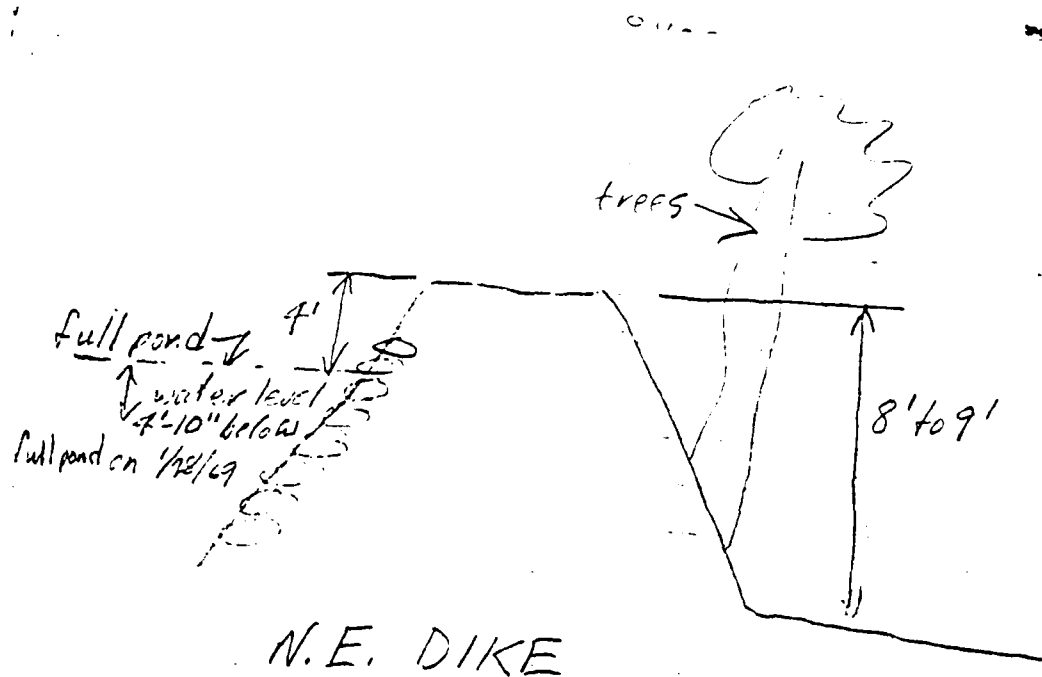
Downstream Conditions swamp and Conn. Turnpike

Summary of File Data some plans in file - not clear if plans
show existing or proposed

Remarks Many large trees on dike appear to be
at least 25 years old. Water level 4'-10" below
full pond. SEE OVER

Would Failure Cause Damage? Yes

Class B



N.E. DIKE

Fairview Res. Dam
Norwich

outlet spillway in Northwest Dam

6/5/73 1 in of water over

dam

trees

full pond 4' -
water level
4'-10" below
full pond on 7/28/69

N.F. DIKE

No. _____ WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Inventoried
By W. A. D.

Date 1/28/69

Name of Dam or Pond Northwest, Connection + Middle Dams (or Dikes) ^{CN} FAIRVIEW RESERVOIR

Code No. T14.7 SS.5 B2.8

Nearest Street Location Conn. Turnpike

Town Norwich

U.S.G.S. Quad. _____

Name of Stream Byron Brook

Owner Town of Norwich Pub. Util. Dept.

Address 34 Shetucket St.

Pond Used For Water supply

Dimensions of Pond: Width _____ Length _____ Area _____

Total Length of Dam see sketch Length of Spillway _____

Location of Spillway see sketch (OVER)

Height of Pond Above Stream Bed _____

Height of Embankment Above Spillway 4'±

Type of Spillway Construction concrete weir with bridge above

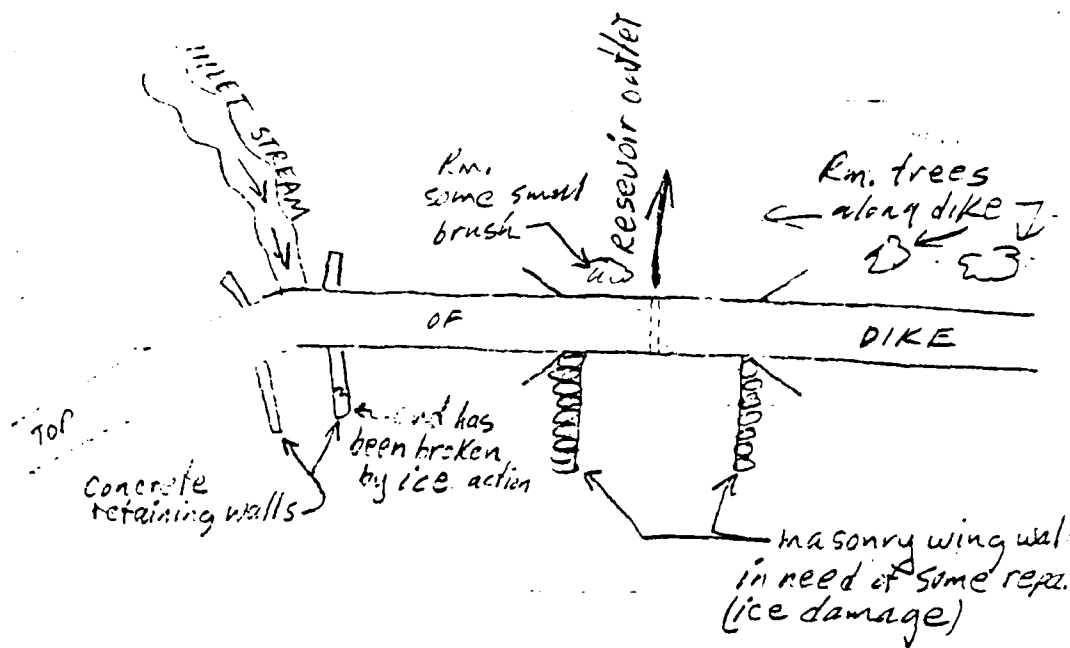
Type of Dike Construction earth with a masonry core wall

Downstream Conditions Swamp and Connecticut Turnpike

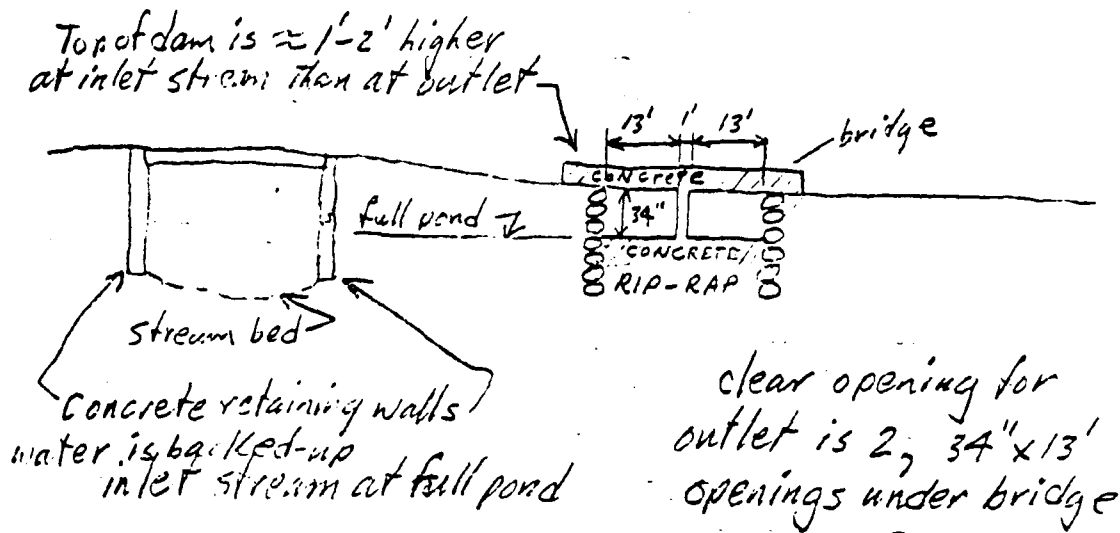
Summary of File Data _____

Remarks Northwest Dam (dike), Connection Dam (dike) and
Middle Dam (dike) form 3 segments of one continuous dam or dike.
see 1st sheet of plans of Reservoir. Water level
4'-10" below S.E.F. OVER full pond.

Would Failure Cause Damage? YES Class B



PLAN OF NORTH WEST DAM



INTERDEPARTMENT MAIL

DATE

February 15, 1968

TO	DEPARTMENT
File	
FROM	DEPARTMENT
Charles J. Pelletier, Princ. Hydr. Engr.	Water Resources Commission
SUBJECT	
Fairview Reservoir Dam - Norwich	

Per request from local officials, this dam was inspected on February 14, 1968.

The reservoir is 1.5 to 2 feet below normal elevation and is ice covered. Mr. Leary of the Norwich Water Department accompanied Mr. William O'Brien and the undersigned during the inspection. We found the dam in satisfactory condition. There was no evidence of significant seepage on the ground surface. The lowest ground along the downstream toe of the dam is wet, a condition which apparently exists continuously. There is no surficial evidence that subsurface seepage endangers stability of the structure.

There are 4 pipes extending from the intake structure through the dam to a manhole about 8 feet in diameter set into the downstream toe of the dam. In the manhole there are valves in each of the pipes. We understand that these valves are all open and operability is uncertain. There are no valves at the intake end of the pipes so that they are at all times under a pressure of about 15 psi. These pipes provide the only means of lowering the reservoir level.

Surficial inspection indicates the dam to be stable and there is no condition indicating the need for subsurface investigation at this time.

While it is not an immediate necessity, it is recommended that consideration be given to (1) plugging the intake end of some of the pipes through the dam or installing upstream valves and (2) installing toe drains and flattening the downstream slope with a free draining material.

C. J. Pelletier
Principal Hydraulic Engineer

BENJAMIN H. PALMER
SHEPARD B. PALMER

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE 687-8640

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DAMS
WATER SUPPLIES
SEWERAGE
APPRAISALS
REPORTS
SURVEYS

NORWICH, CONN. 06360

February 14, 1968

Department of Public Utilities
City of Norwich
34 Shetucket Street
Norwich, Connecticut

Attention: Mr. Robert E. Grimshaw

Dear Mr. Grimshaw:-

Today at the request of Mr. Leary I inspected with him the dam at Fairview Reservoir. In particular I checked the toe of the slope of the embankment at the South end of the Reservoir.

Near the East end of the toe of slope there is a small area where marsh grass is growing. The ground here was moist and in some places wet. There was no indication of any running water. This is probably caused by a small amount of seepage. From the presence of marsh grass I believe this condition has existed for a long time. It is quite common to see this at the downstream side of a dam.

The gate manhole in the embankment was also inspected. The walls were damp but no indication of running water.

It is my opinion that the dam is in good condition at the present time.

Very truly yours,

CHANDLER & PALMER

Shepard B. Palmer

SBP/ew

RECD	Y-15-68
J.V.	
WAL	
AIN	
PRG	
J.S.	
NFL	
RAU	
FILE	

NORWICH DEPARTMENT OF PUBLIC UTILITIES
DEPARTMENT CORRESPONDENCE

DATE October 27, 1943

TO Michael F. Quinlan, Purchasing Agent DEPT. City Hall
FROM Philip L. White, General Manager DEPT. Public Utilities
SUBJECT REPAIRS AT FAIRVIEW RESERVOIR DAM

An inspection of the upstream face of the dam at Fairview Reservoir reveals the fact that repairs are urgently needed to this wall. This was a laid-up scumwall, installed about 1943, and apparently was hand plastered with cement. Some of this plaster has fallen off leaving voids, some of which are as much as 30" deep. Other pieces of plaster are hollow and the plaster is ready to fall off. We have intentionally drawn down the level of this reservoir this year to permit this inspection, since we suspected this condition existed. These repairs are needed at once before the onset of cold weather and will have to be done by the Gunite method.

We have been in contact with five (5) different Gunite Companies and find that one (1) has gone out of business and two (2) of them will not have crews available to do the work this Fall. We have secured proposals from the two (2) companies who could undertake this work and had them quote a price on a per bag of cement basis since the exact quantities cannot be determined. The lowest quotation was from the Eastern Gunite Corporation of Waltham, Massachusetts, who quoted \$11.35 per bag. We estimate the total cost of this work to be between \$6,500.00 and \$7,000.00. We propose to issue our Purchase Order No. 33236 to the Eastern Gunite Corporation for the work involved.

We would appreciate your indicating your approval by signing and returning one copy of this letter.

7/10/43

cc Charles E. Levine, City Manager
S. C. Starna, Util. Purchasing & Stores Dept.
W. F. Leary, Water Superintendent ✓

APPROVED:

/s/ M. F. Quinlan
City Purchasing Agent

BENJAMIN H. PALMER
SHEPARD B. PALMER

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE 887-5640

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DAMS
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SEWERAGE
APPRAISALS
REPORTS
SURVEYS

NORWICH, CONN.

May 10, 1965

Re: Fairview Reservoir
NORWICH

Water Resources Commission
State Office Building
Hartford (15) Connecticut

Attention: Mr. William P. Sander
Engineer - Geologist

Dear Sir:-

At the time of my inspection of this dam about a year ago I suggested that the trees on the downstream embankment of the dam be cut.

I inspected this dam again on May 8, 1965 and find that all work called for has been completed. It is my opinion that the dam is in good condition at the present time.

Very truly yours,

BHP/ew

B H Palmer

CT-205

Date May 1 1964

Name of Dam or Pond _____

Code No. T 14.7 Y2.4 BB 1.2

Nearest Street Location _____

Town _____

U.S.G.S. Quad. 14-10-100

Name of Stream _____

Owner _____

Address _____

Pond Used For Water, Irrigation

Dimensions of Pond: Width 1 Length 80.4 Area 80.4

Total Length of Dam 2700 Length of Spillway 26

Location of Spillway _____

Height of Pond Above Stream Bed 76

Height of Embankment Above Spillway 4'

Type of Spillway Construction 1Type of Dike Construction 5

Downstream Conditions _____

Summary of File Data

Remarks GA-14870 REPT - NOTES 5-10-65 STATE 107 IS MY

STATED THAT THE CAR IS IN GOOD CONDITION AT
PRESENT TIME.

Would Failure Cause Damage? _____ Class 2000

6/5/73 1 in of water over spillway
dam appears safe Allen Bunthe

9:09 PM - 11:00 PM - WATER LEFT DOWNSTREAM SLOPE
SLOPE IS SAFE - DAM APPEARS SAFE
WATER ABOVE DOWNSTREAM TOE OF DIKE AT
11:00 PM

Copy available to DTIC does not
permit fully legible reproduction

BENJAMIN M. PALMER
SHEPARD S. PALMER

H. G. Leary

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE TRUNK 7-8840

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DAMS
WATER SUPPLIES
SEWERAGE
APPRAISALS
REPORTS
SURVEYS

NORWICH, CONN.

June 17, 1963

Mr. Philip L. White
General Manager
Gas & Electric Department
Public Utilities
Norwich, Connecticut

Dear Sir:-

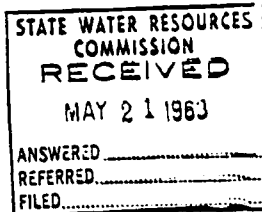
At the request of Mr. Leary I made a further inspection over the week-end of the area just downstream from the Fairview Reservoir Dam. There is a small wet spot on the Easterly side of the dam at the foot of the embankment. I think this is from water coming up through a spring from the side hill. It is very small and there is no evidence of any leaks through the dam and I do not consider it hazardous in any respect.

Very truly yours,

CHANDLER & PALMER
S. H. Palmer

BHP/ew

tku



May 20, 1963

Re: Fairview Dam

Mr. Philip L. White
General Manager
Public Utilities Department
Norwich, Connecticut

Dear Sir:-

I have this weekend made an inspection of the Fairview Dam and Reservoir. This is located in the Norwich Town section of Norwich and forms one of the reservoirs for water supply for the City of Norwich.

The date on the gate house is 1868 and I assume this is the time of the original construction. The Dam itself is an earth dam with a vertical stone face wall on upper side and an earth slope on the downstream side. The width of dam at top is 25 feet and I estimated the maximum height at about 30 feet. The structure is about 500 feet long and is in good condition. I walked along the top and also along the base of slope and could detect no leaks. I would say it was in good shape.

I am concerned over the large number of evergreen trees on the downstream slope. It looks as though they had been set out years ago and there are a great many of them. I admit they look attractive but I don't think they add to the safety of the dam. I am suggesting that you cut down the ones near the top of the slope on the theory they would be subject to the greatest wind pressure coming off the pond. There is less danger down the slope as the base of dam widens and wind pressure decreases. I would say that measuring down the slope from the top, all trees should be removed for a distance of 20 feet along the slope.

The spillway is not at the main dam but is at the North end of the reservoir. About 1" of water was overflowing at the time of my visit. Everything here appeared to be in good order.

Very truly yours,

A handwritten signature in cursive script, appearing to read "B. H. Palmer".

BHP/ew
c.c.: Mr. Emitt A. Dell
State Field Inspector

This is a copy of a memo
in the files of the Norwich
Dept. of Public Utilities
(Water Division)

Friday, September 10, 1960

About 1:30 p.m. I was contacted by Al Nystrom that he was finished with the
repair of the screen strainer at the well. I contacted the Oliver (Paul) Wagon, and
the tender of the well and showed them the way to Fairview Reservoir where
we set up for the afternoon to examine the condition of the screens and
motor drive in the well house.

He reports as follows: On the end of main suction line there is a
screen or strainer strainer that is shaped like a football and is about 5 feet
long. It is in good condition. It was covered lightly with moss. The
height of this strainer is approximately 5 feet off the bottom. This suction
line has two bales for a cable to be attached to. The copper cable is
attached to the cable nearest the strainer and the other bale is about 10 feet
from the strainer.

The suction line is made of galvanized iron and is hand riveted.

There are two standpipes, one on either side of the suction line.
These two standpipes are about eleven feet off the bottom with a five foot long
pipe shaped strainer on top of each. These strainers are loose, but in
good condition, outside of one small one-half inch hole on the left hand
standpipe facing the well house.

Inside of the well house there is an accumulation of dirt and rotten
boards. The drain for the well house was not found.

We disassembled the equipment and went to Stony Brook gate house and
reassembled the equipment to investigate the gate in the well house.

On number one, on top gate, which was opened at the time we shut to
see if it would close because of fresh water humbles or tuberculation.
It shut fairly tight because the water level fell in the well house.

Fairview
Res. Dam

Stoney
Brook Dam
Montville

Number two, or middle gate, was closed and was encased with barnacles or tuberculation. The shaft on this gate was bent and the guide brace was pulled away from the wall, making it impossible to operate this gate.

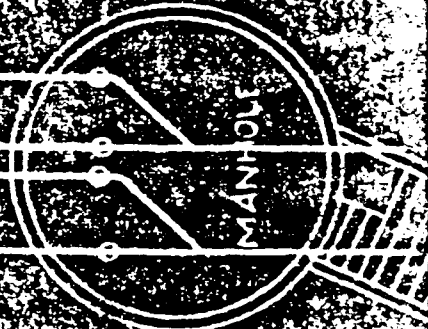
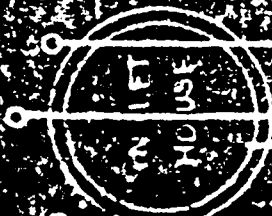
On checking gate number 3, or bottom gate, the diver found this gate also encased with barnacles or tuberculation and was tightly shut. The guide braces on this gate seemed to be in good order. I did not try to open this gate as I was afraid sediment might get in the well, also, all exposed metal in the well was heavily covered with barnacles or tuberculation.

This operation was performed by the Whaling City Marine and Dock Corporation, Groton, Conn.

APPENDIX B-3

Plans, Sections, Details.

FAIRVIEW RESERVOIR



301

471

471

471

AD-A143 498

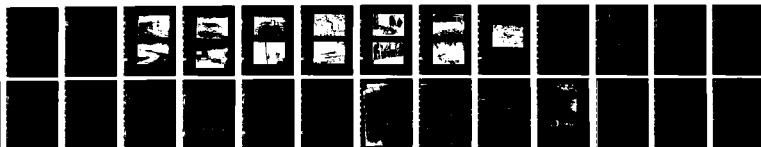
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
FAIRVIEW RESERVOIR DA. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV NOV 78

2/2

UNCLASSIFIED

F/G 13/13

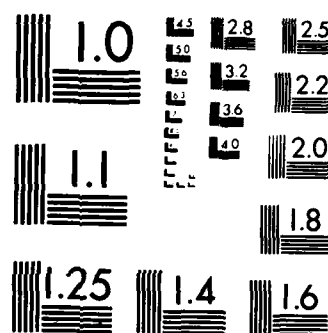
NL



END

FILED

DEC

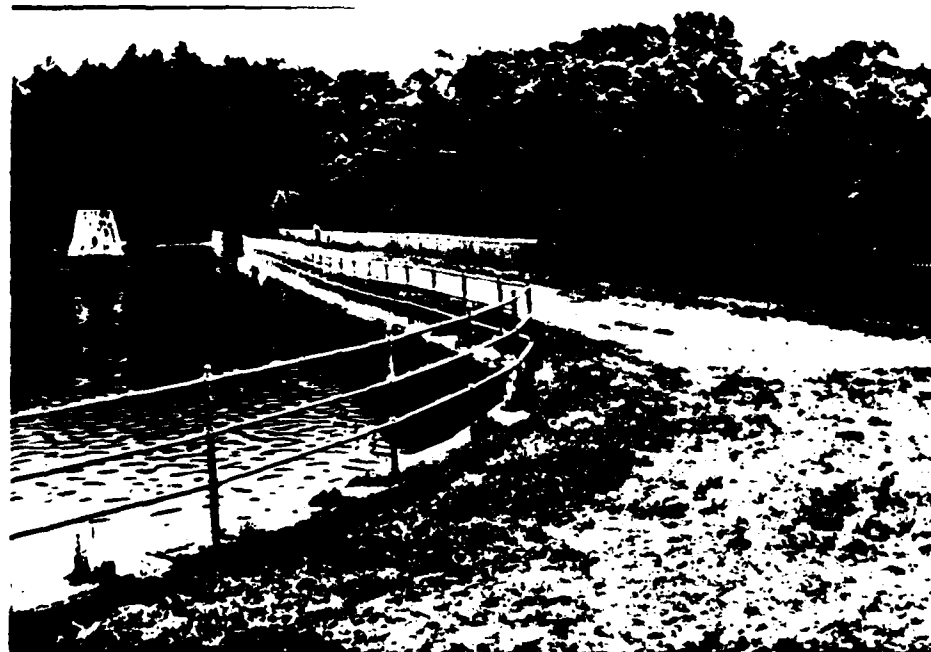


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

APPENDIX C
SELECTED PHOTOS



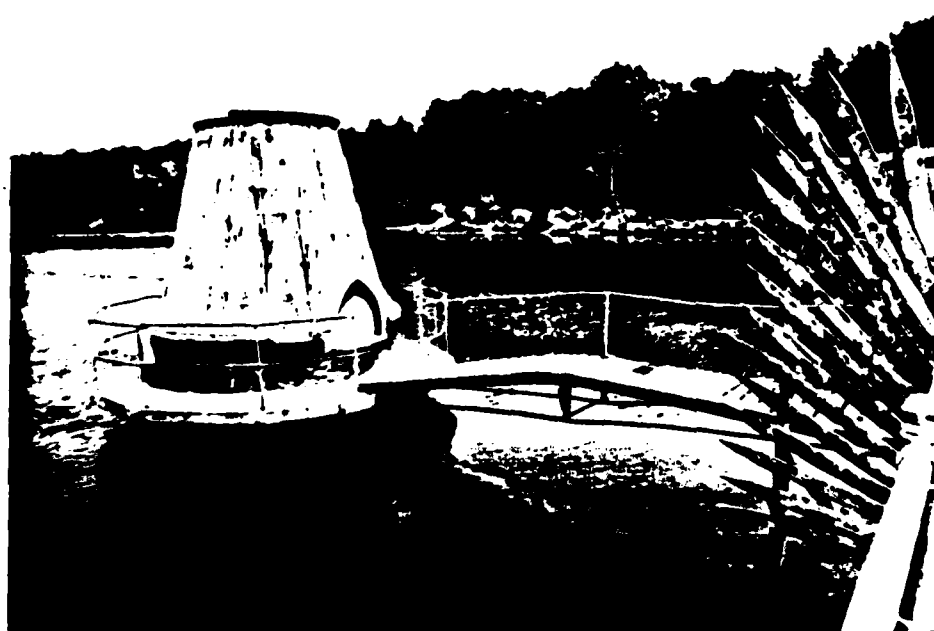
C-2 MAIN DAM-LOOKING FROM LEFT ABUTMENT ALONG
UPSTREAM FACE.



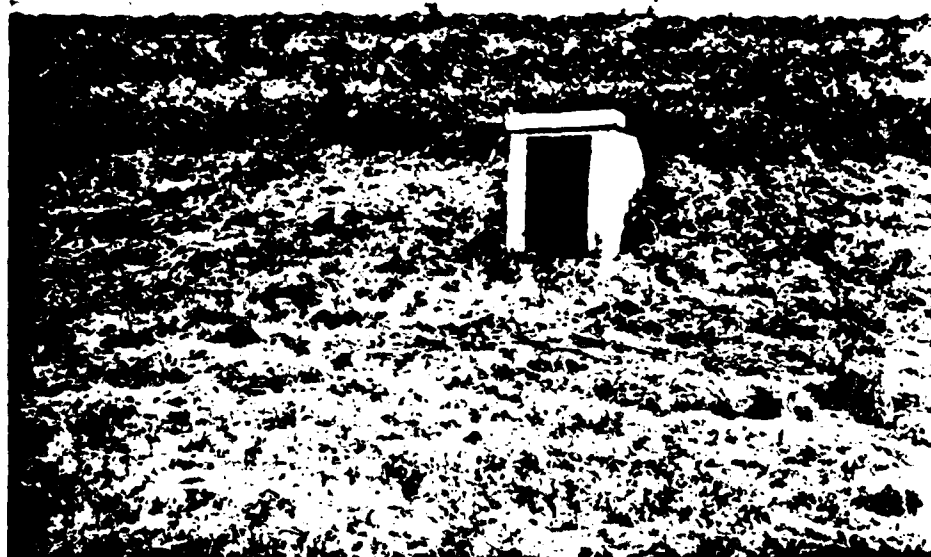
C-3 MAIN DAM-LOOKING FROM RIGHT ABUTMENT ALONG
UPSTREAM FACE. (NOTE: CURVATURE OF FACE AND RAILING.)



C-4 DOWNSTREAM FACE OF MAIN DAM



C-5 OUTLET CONTROL - TO SYSTEM



C-6 ENTRANCE TO VALVE CHAMBER AT DOWNSTREAM TOE OF
MAIN DAM



C-7 INTERIOR OF VALVE CHAMBER



C-8 STUMPS ON DOWNSTREAM FACE



C-9 SEEPAGE AREA AT TOE TOWARD RIGHT ABUTMENT



C-10 INTAKE STRUCTURE TO RESERVOIR



C-11 WINGWALL AT INTAKE STRUCTURE



C-12 OVERFLOW SPILLWAY - LOOKING UPSTREAM BENEATH
ROADWAY BRIDGE



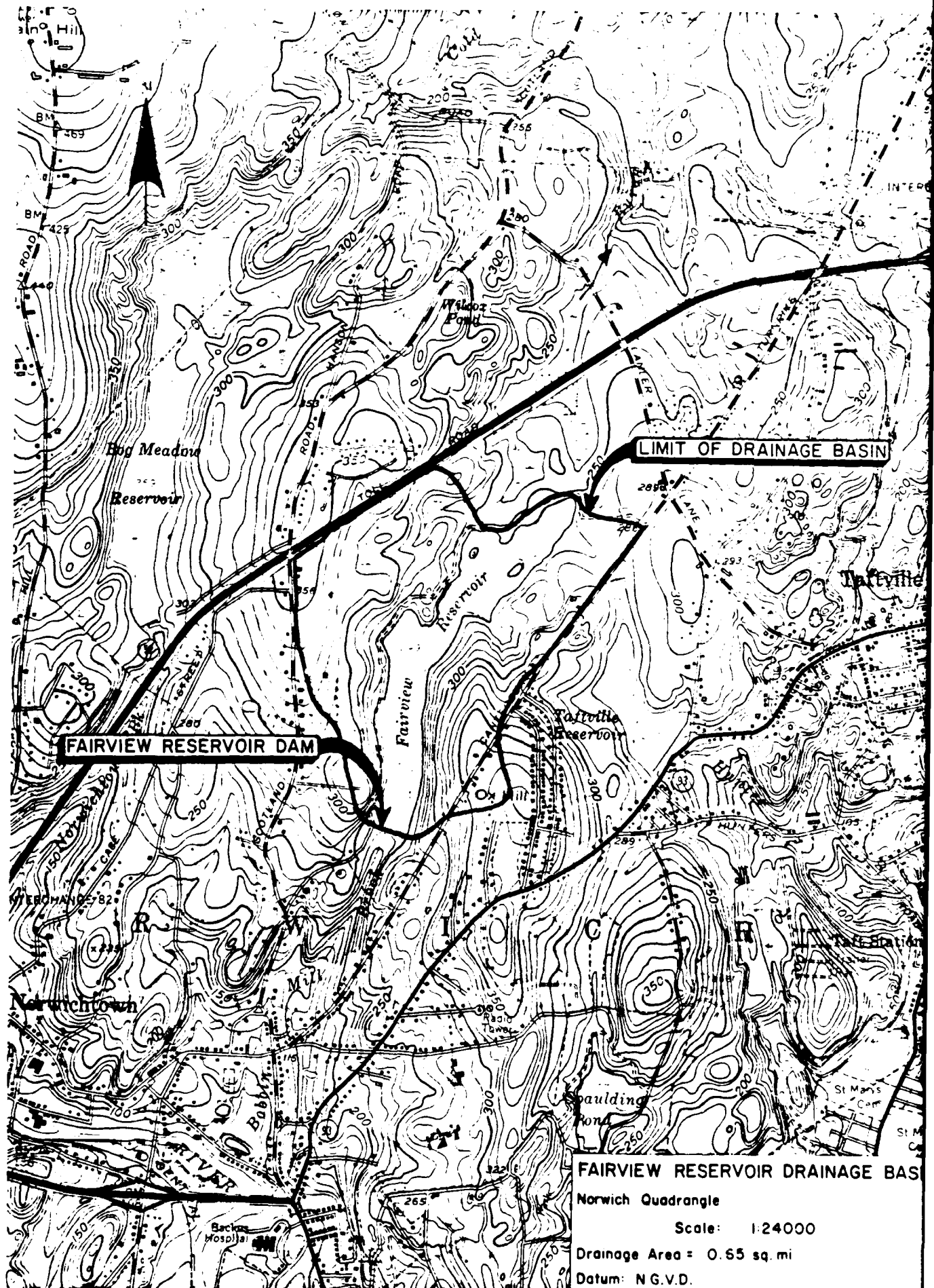
C-13 TYPICAL VEGETATIVE GROWTH ON DIKE SLOPE



C-14 SEEPAGE ALONG DIKE

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS



FAIRVIEW RESERVOIR DRAINAGE BASIN

Norwich Quadrangle

Scale: 1:24000

Drainage Area = 0.65 sq. mi

Datum: N.G.V.D.

A. Size Classification

Height of Dam = 280 feet; Hence SMALL

at crest elevation reservoir storage = 768 AC-ft., hence SMALL

adopted size category SMALL

B. Hazard Potential

DAM IS LOCATED IN A PROTECTED, WOODED WATERSHED FOR A
RESERVE AND STANDBY WATER SUPPLY. FAILURE OF DAM WILL
CAUSE DAMAGE TO LIFE AND PROPERTY AND C. ALSO
INVOLVE APPRECIABLE ECONOMIC LOSS. HAZARD POTENTIAL
IS CONSIDERED HIGH.

It is estimated from the rule of "thumb" failure hydrograph as follows:

<u>Category</u>	<u>Loss of Life</u>	<u>Economic Loss</u>
		Homes = YES
<u>HIGH</u>	<u>YES</u>	Buildings = YES
		Farms = NO
		Miscellaneous = YES
		Highways or roads = YES

C. Hazard Size "Test Flood" or Spillway Design Flood
HIGH SMALL 1/2 PMF TO PMF

Adopted
 S.D.F. (test flood) = PMF

Adopted value of test flood due to watershed characteristics = 2500 CSM

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: 6/19/78

Name of Dam FAIRVIEW RESERVOIR DAM ; Location of Dam BOBBIN MILL BROOK Town NORWICH, CT.

Watershed Characterization ROLLING HILLS WITH SWAMPS

Adopted "test" flood = ONE PMF = 2500 CSM = 1625 C.F.S.

D.A. = Drainage Area = 0.65 Square Miles = Acres

S.A. = Surface Area of Reservoir = 0.16 Square Miles = 102 Acres

Shape and Type of Spillway = OVERFLOW - UNCONTROLLED - BROAD CRESTED

B = Width of Spillway = 27.0 feet; C = Coefficient of Discharge = (3.09 - Friction) = 3.00

Maximum Capacity of Spillway Without Overstopping = 648 C.F.S. = % of test flood

Top of Dam Elevation = 253.00 ; Spillway Crest Elevation = 249.00

Length of Dam = 520 feet

Name of Dam	Test Flood Qp1 CSM	Inflow Characteristics			Outflow Characteristics First Approximation			Outflow Characteristics Second Approximation			Outflow Characteristics Third Approximation		
		h1 in feet	S1 in inc.	Qp1 CFS	h2 in feet	S2 in inc.	Qp2 CFS	h3 in feet	S3 in inc.	Qp3 CFS	h4 in feet	S4 in inc.	Qp4 CFS
1	2	4	5	6	7	8	9	10	11	12	13	14	15
FAIRVIEW RESERVOIR	1625	4.73	13.96	1625	4.73	13.96	13.53	4.59	13.51	13.75	4.66	13.56	

h = discharge; h = surge height S = Storage in inches NOTE: Outflow discharge values are computed as per C.O.E. guidelines but with due consideration given to

Overtopping Potential

Spillway crest elevation = 249.00 M.S.L.

Top of dam elevation = 253.00 M.S.L.

Maximum discharge capacity of)
Spillway without overtopping) = 648 C.F.S.

"Test flood" outflow discharge = 1356 C.F.S.

% of "Test flood" carried by)
Spillway without overtopping) = 47.8 % 1

"Test flood" outflow discharge = 708 C.F.S.
which flows over the dam

= 52.2 % of "Test flood" 2

1 + 2 = 100%

"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Hydrograph"

BASIC DATA

Name of Dam Fairview Reservoir Dam Name of Town Norwich, Connecticut
 Drainage area = 0.65 sq. mi. Top of dam 253.0 NGVD
 Spillway type = overflow-Broad Crest Crest of spillway 249.0 NGVD
 Surface area at crest elevation = 102 acres
 Reservoir bottom near dam = 222.00 NGVD
 Assumed side slopes of embankments = 2:1
 Depth of reservoir at dam site 27.0 ft. = y_0 = 27.0 ft.
 Mid-height elevation of dam = 237.50 NGVD
 Length of dam at crest = 520 feet
 Length of dam at mid-height = 439 feet
 20% of dam length at mid-height = W_b = 87 feet

Step 1:

Elevation NGVD	Reservoir Estimated Storage In AC-ft.
249.0	768
250.0	870
251.0	972
252.0	1,074
253.0	1,176
254.0	1,278

Step 2:

$$Q_{p1} = \frac{8}{27} W_b \sqrt{g} y_0^{3/2}$$

$$= \underline{1.68} W_b y_0^{3/2} = 20,500 \text{ CFS}$$

Failure of dam is assumed to instantaneous when pool reaches top of dam

DAM FAILURE ANALYSIS

FAIRVIEW RESERVOIR DAM

1. Failure discharge with pool at top of dam = 20,500 CFS
2. Depth of water in reservoir at time of failure = 27.0 feet
3. Maximum depth of flow downstream of dam at time of failure = 18.0 feet
4. Water surface elevation just downstream of dam at time of failure = 240.0 NGVD

The failure discharge of 20,500 CFS will enter Bobbin Mill Brook and flow downstream 3,000 feet until the brook crosses Scotland Road near the intersection of Canterbury Turnpike. There is not significant valley storage to reduce the discharge in this 3,000-foot length of stream. But, due to roughness, characteristics, and slope of the stream, it is very likely that dam failure flow will dissipate its kinetic and wave energy and thus convert an unsteady to a steady flow profile. It is estimated that depth of flow near and below Scotland Road will be approximately 8 feet, obeying uniform flow (Manning's) Formula. The failure profile will have the following hydraulic characteristics until the brook joins the Yantic River.

- a. Water surface elevation just downstream of dam = 240.0 NGVD
- b. Water surface elevation near Scotland Road = 148.00 NGVD
- c. Water surface slope between Dam and Scotland Road = 0.031
- d. Beyond Scotland Road and until the brook joins Yantic River, the failure discharge will flow in the below given channel characteristics:

- | | | |
|---|---|-------------------|
| Q | = | 20,000 CFS |
| s | = | 0.0015 <u>+</u> |
| n | = | 0.05 (weighted) |
| b | = | 500 feet <u>+</u> |
| d | = | 8.0 feet |

Side slopes = 1V on 2H

Spillway Rating Curve Computations

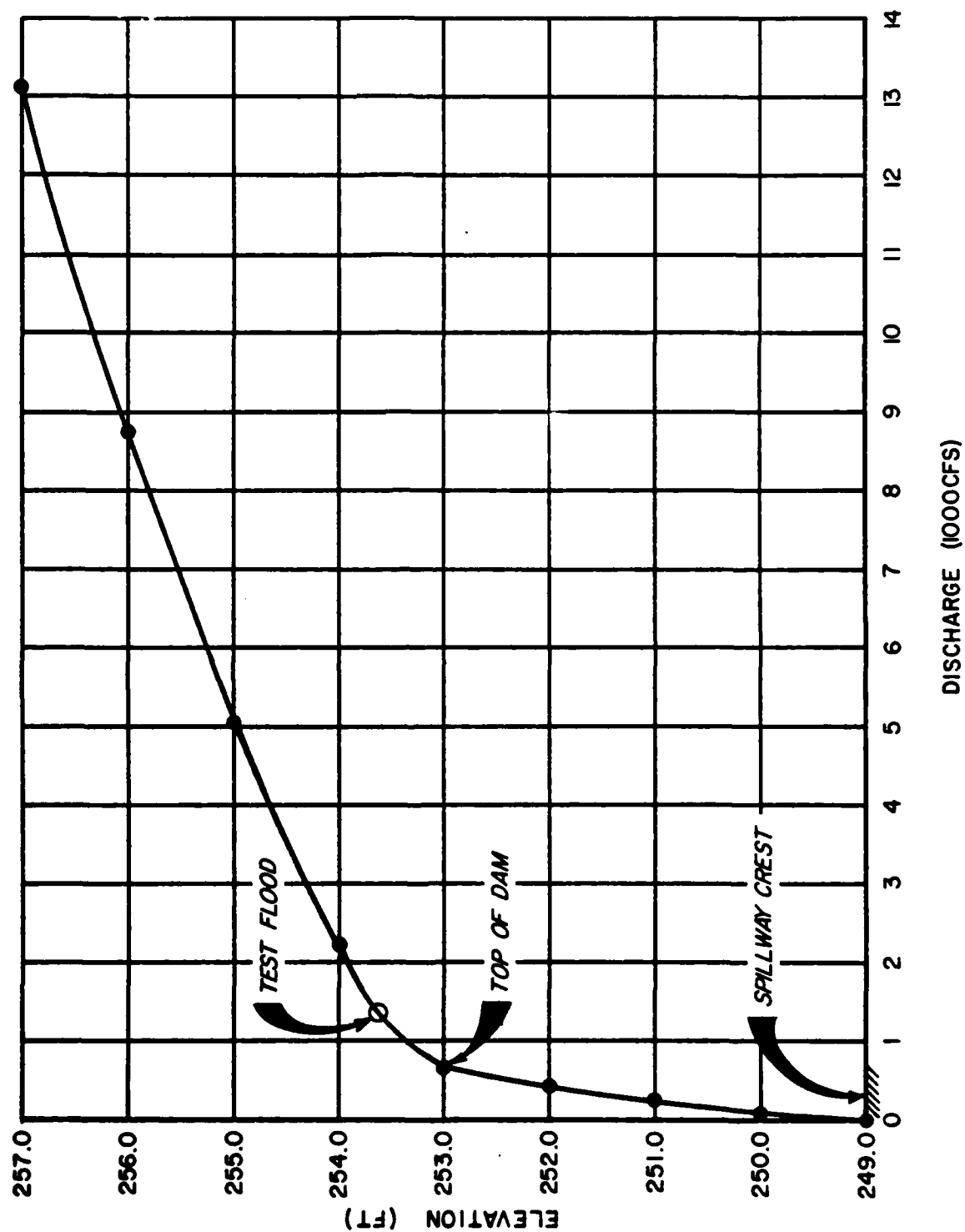
Fairview Reservoir Dam

Spillway Width = 27.0 ft.;
Length of Dam = 520.0 ft.;
C = 3.00

Spillway Crest Elevation = 249.0 NGVD
Top of Dam Elevation = 253.00 NGVD

Elevation (ft.) NGVD	Discharge (CFS)	Remarks
249.0	0	Crest of Spillway
250.0	81	
251.0	229	
252.0	421	
253.0	648	Top of Dam
254.0	2,208	
255.0	5,060	
256.0	8,754	
257.0	13,128	

Frequency and Discharge (CFS)	Elevation (ft.) NGVD
Q ₁₀ = 24	249.45
Q ₅₀ = 49	249.70
Q ₁₀₀ = 58	249.80
Q $\frac{1}{2}$ PMF = 165	250.61
Q PMF = 1,356 (Test Flood)	253.66



SPILLWAY RATING CURVE
FAIRVIEW RESERVOIR

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS



INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CORNER	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
CT	205	NED	CT	011	02	FAIRVIEW RESERVOIR DAM	4133.6	7205.0	00NOV78

POPULAR NAME	NAME OF IMPOUNDMENT
	FAIRVIEW RESERVOIR

REGION/DASH	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (mi.)	POPULATION
01 07	BOBBIN MILL BROOK	NORMICH TOWN	1	41400

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRAKE HEIGHT (FT.)	HYDRAU. HEIGHT (FT.)	IMPOUNDING CAPACITIES (ACRE-FT.)	MAXIMUM ()	NORMAL ()
REERPG	1868	S	20	20	1176	760	

DIST OWN FED R PRV/FED SC8 A VER/DATE
N N N N N

REMARKS

D/S HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (KW)	INSTALLED PROPOSED	NAVIGATION LOCKS
1	520 U 27	648				

OWNER	ENGINEERING BY	CONSTRUCTION BY
NORMICH DEPT PUBLIC UTIL	J T FANNING	

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	STATE CONN DEP

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
C & C MAGUIRE, INC	19JUN78	PL 92-367

REMARKS

Score: 0.

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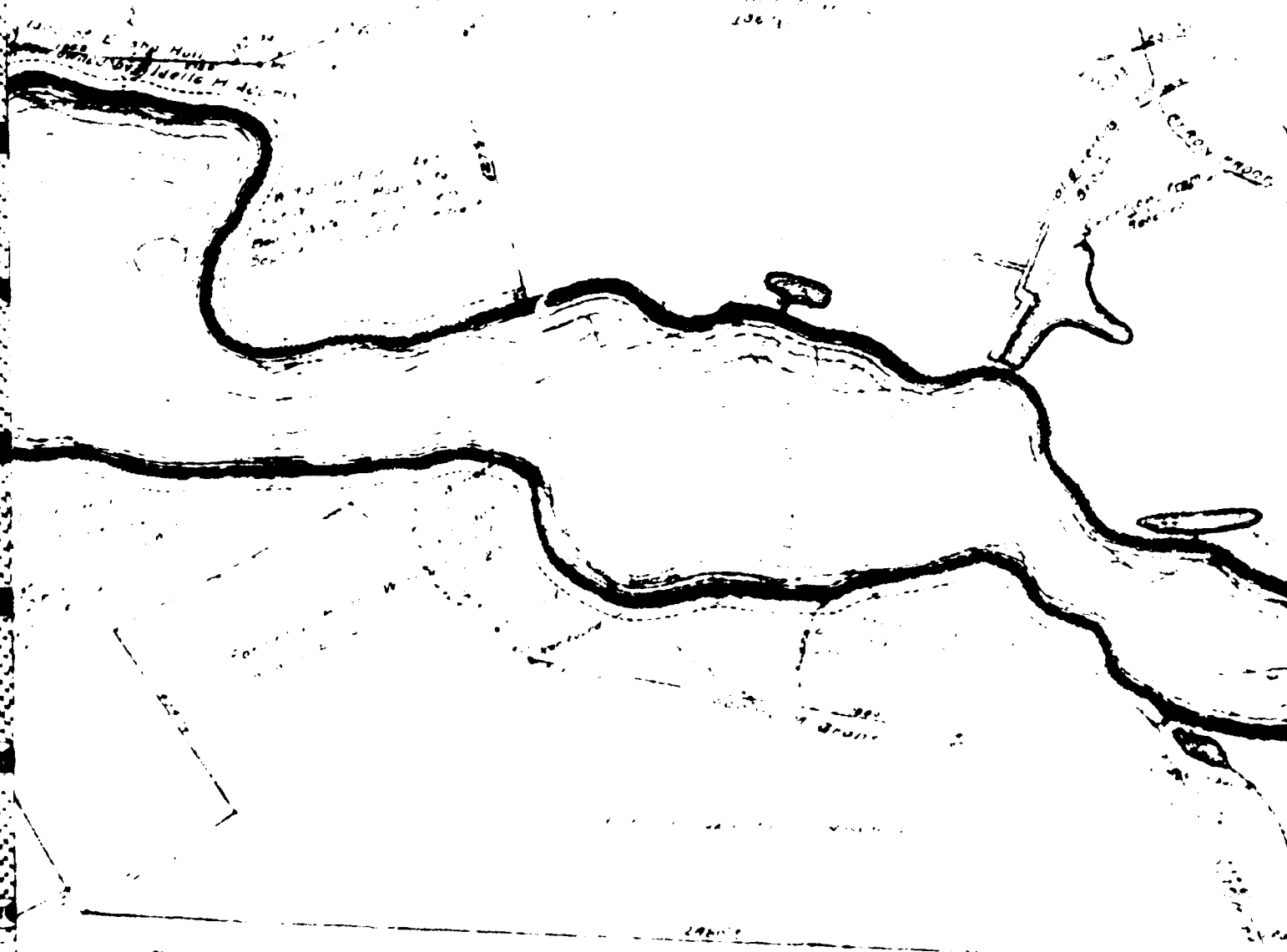
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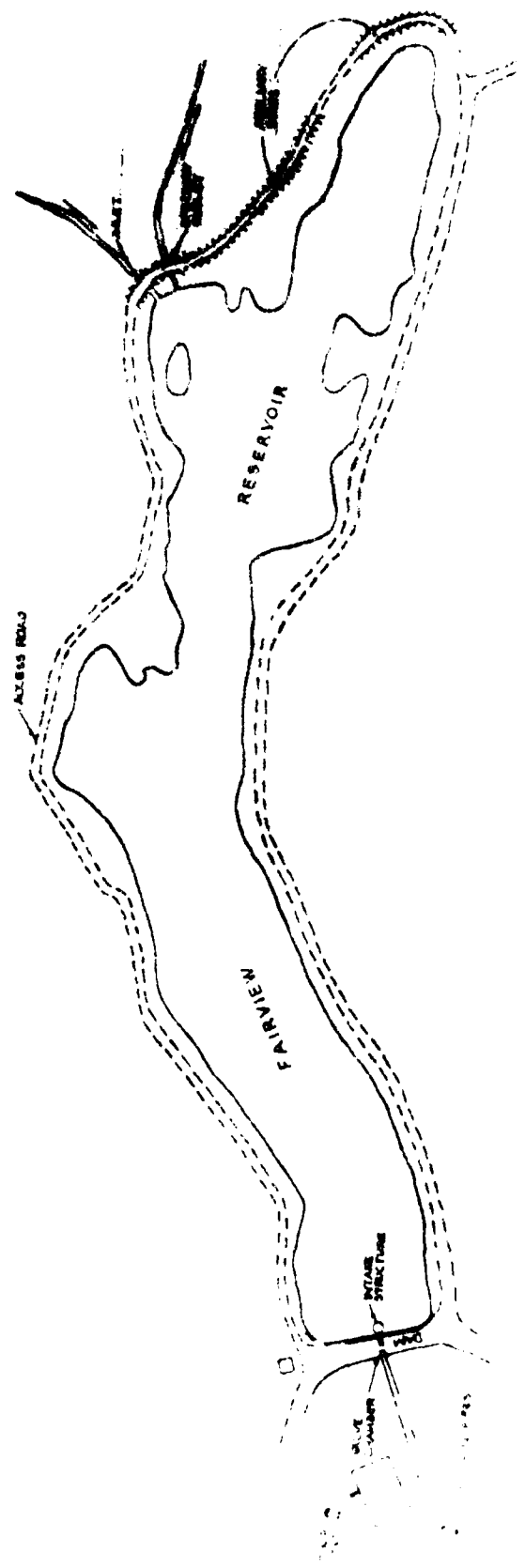


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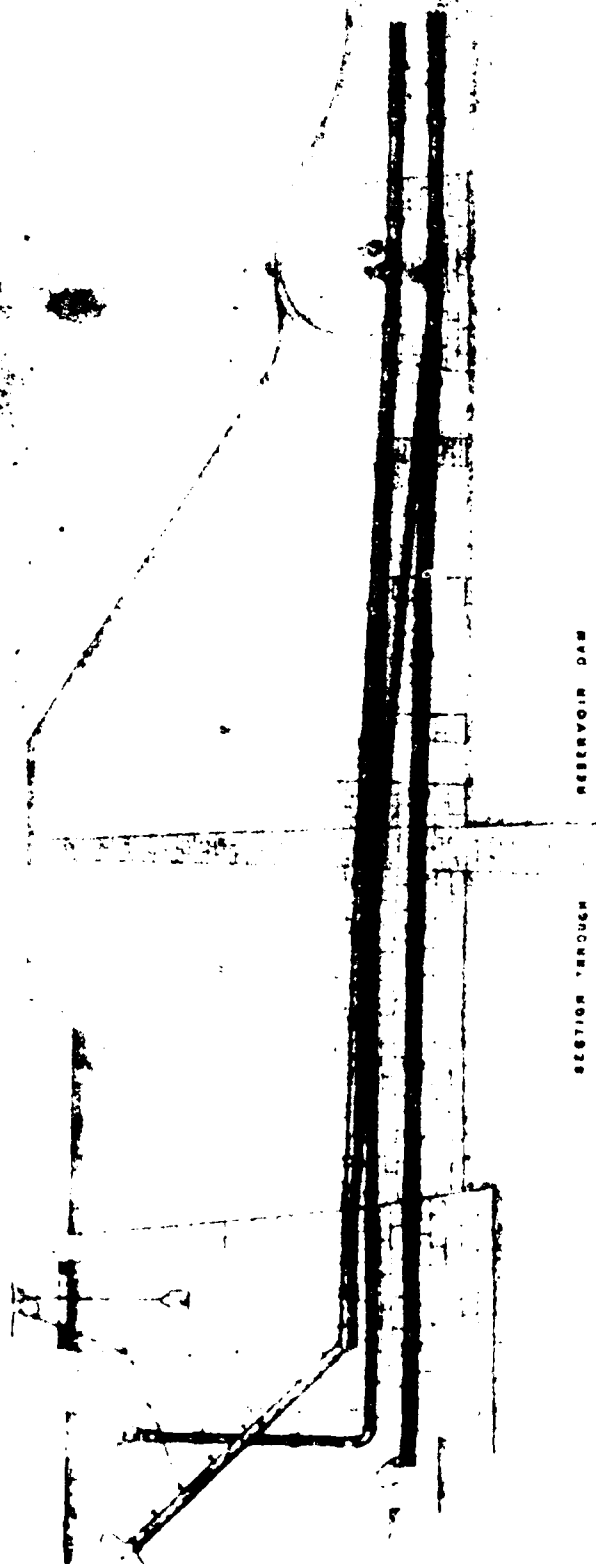


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